Reducing Stress in School-Age Girls: Mindful Awareness for Girls through Yoga (MAGY)

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REDUCING STRESS IN SCHOOL-AGE GIRLS: MINDFUL AWARENESS FOR GIRLS THROUGH YOGA (MAGY)

a dissertation

by

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Abstract

This randomized intervention study examined the efficacy and feasibility of a stress reduction program using mindful movement to decrease levels of perceived stress, facilitate coping, enhance self-esteem, and self-regulation in school-age girls.

School-age children experience stressors with serious sequelae and need to respond with multiple coping strategies. Girls use maladaptive coping strategies and report lower self-esteem. Evidence-based interventions for stress management in children are scant, contributing to missed opportunities for preventing illness and promoting health.

Mindfulness-based stress reduction is a training program of awareness-based practices, including yoga, which was adapted to the development of school-age girls. The questions included: (1) To what extent do school-age girls who participate in an eight week mindful movement intervention report significantly different levels of perceived stress, effectiveness and number of coping strategies, levels of self-esteem, and self-regulation than girls in a wait-list control group? (2) To what extent is the dose of mindful movement inversely correlated with perceived stress and positively correlated with effectiveness and number of coping strategies, self-esteem, and self-regulation?

A sample of fourth and fifth grade girls was recruited from two public schools randomized as intervention and wait-list control. The intervention group met one hour a week for eight weeks and completed ten minutes of daily homework.

Repeated Measures Analysis of Variance with an intention to treat analysis (n=155) was used. No differences between groups were found. Both groups reported increased self-esteem and self-regulation over time. Compared to the control group, the intervention group was more likely to increase their frequency of coping ($p< .05$). The amount of home yoga practice predicted an increase in stress scores**.** Supplemental analyses found the intervention group was more likely to report increasing stress appraisals ($p<.01$). Coping frequency and stress appraisal scores were not correlated at Time 1 in the intervention group, but were positively correlated at Time 2.

The intervention group may have become more aware of feelings associated with stress and generated coping, or may have experienced increasing stress as part of mindfulness training. School-based mindfulness interventions are feasible and may be coordinated by school nurses, but require more investigation. Limitations, implications, and suggestions for future research are discussed.

CHAPTER ONE

Statement of the Problem

School-age children are constantly confronted with developmental, interpersonal and academic demands in their daily lives. School-age children report multiple stressors, such as tests, homework, peer pressure, being teased, receiving poor grades (Ryan-Wenger, Sharrer, & Campbell, 2005; Sharrer & Ryan-Wenger, 2002); fear of the effects of war (Ryan-Wenger, 2002), bullying (Horowitz et al., 2004), standardized testing (Skybo & Buck, 2007), and perceived parental pressure and isolation (Luthar, 2003). This is further exacerbated by the current lack of unstructured play and recess in schools (Ginsberg, 2007).

While attention has focused on acute traumatic events, it is the daily, cumulative events experienced by children that may have a greater deleterious effect on physical and psychological health (Fields & Prinz, 1997; Compas, Malcarne, & Fondacaro, 1988; Carter, Garber, Ciesla, & Cole, 2006) and mediate the impact of major life events on psychological health (Wagner, Compas, & Howell, 1988).

School-age children experiencing stress may suffer from somatic and psychological ailments such as headaches, abdominal pain, school absenteeism, delayed school readiness, depression, anxiety, overeating, tobacco use, and substance abuse (Jenkins, Rew, & Sternglanz, 2005; Natvig, Albrektsen, Anderssen, & Qvarnstrom, 1999; Orlando, Ellickson, & Rand, 2001; Strine, Okor, McGuire, & Balluz, 2006; Thomsen, 2002; White & Farrell, 2005). The effects of childhood stress have become a major health concern, prompting the American Academy of Pediatrics (2008) to recommend routine

screening for depression and to provide information about stress on their website for teens and parents.

The ability to generate effective coping strategies is paramount in managing a stressful experience to protect children from the deleterious effects of stress (Grant et al., 2006). Therefore, the ability to effectively manage stressful experiences has important immediate and long-term physical and psychological benefits (Carter et al., 2006; Compas, Howell, Phares, Williams, & Giunta, 1989).

Learning effective coping strategies may build resistance to the expected and unexpected traumas of life as a part of a life long trajectory of creating resilience (Rutter, 2006). The development of coping strategies in childhood may determine patterns of coping that are the foundation of lifelong habits that may impact future health and psychological development (Compas et al., 1989).

School-age children appraise stressors and generate a variety of coping strategies (Sharrer & Ryan-Wenger, 2002; Walker, Smith, Garber, & Claar, 2006). Children not only require a repertoire of coping strategies to effectively manage stress, but also the ability to generate multiple strategies during a stressful encounter (Lazarus & Folkman, 1984; Langer, Chen, & Luhmann, 2005). The ability to appraise the fit between strategies and varying stressors may also be an important factor in the effectiveness of the coping response (Compas, Malcarne, & Fondacaro, 1988).

Childhood coping is part of a self-regulatory process. By middle to late childhood, children have developed methods of emotional regulation and problem solving. School-age children have more complex language and are developing metacognition, such as

reframing, restructuring, cognitive representation, the use of self talk to mitigate negative emotions and greater flexibility in generating coping responses (Compas, 2001). School-age children are also able to discern levels of stress and demonstrate the self-awareness to report that stress serves as motivation, but only if they are able to maintain clarity of thought (Brobeck, Marlund, Haraldsson, & Berntsson, 2007). The appraisal of stressors and coping responses may be affected by children's individual differences such as gender, self-esteem, and locus of control. Girls are more likely to internalize their feelings, experience depressive symptoms, and be more concerned than boys with social relationships or social norms and expectations (Hampel & Peterman, 2006; Washburn-Ormachea, Hillman, & Sawilowsky, 2004). Girls tend to use coping strategies that are considered maladaptive, such as rumination, resignation, and passive avoidance and more anger-control (Hampel & Peterman, 2006). Girls use more social support and report more perceived interpersonal stress (Burgess, 2006; Griffith, Dubow, & Ippolito, 2000; Hampel & Peterman, 2006; Washburn-Ormachea et al., 2004). The greater use of ruminative coping is associated with the increased risk of depression in early adolescent girls (Papadakis, 2006). Differences in the individual characteristics, such as gender, self-esteem, and control, as well as the specifics of the situation affect cognitive appraisal.

Self-esteem is an important asset in the process of cognitive appraisal and coping resources, especially for girls. Self-esteem may affect appraisals which may under or over-estimate the impact of an event (Kliewer & Sandler, 1992). Harter (1986) suggests

that children with a higher sense of self-esteem may utilize more effective mechanisms to manage perceived threats to their self-esteem.

Self-esteem may mediate the relationship between stressors and internalizing psychopathology in children (Haine, Ayers, Sandler, Wolchik, & Weyer, 2003). Levels of self-reported self-esteem buffered the effects of stressors on psychological outcomes in 8 to 16 year old girls compared to no effect in boys of the same age (Kliewer & Sandler, 1992). Despite the importance of self-esteem for girls, lower levels of self-esteem are reported by girls compared to same age boys (Robins & Trzesniewcki, 2005).

The adolescent period is characterized by many changes and transitions associated with potential developmental problems such as low self-esteem (Eccles, 1999). Self-esteem rises and falls throughout the life span. During late adolescence, self-esteem drops to a level which persists into adulthood. However, levels of self-esteem are less stable and possibly malleable during late childhood and early adolescence. Therefore, interventions may be most effective when introduced prior to the decreased self-esteem of late adolescence (Robins & Trzesniewcki, 2005). The fourth and fifth grade school-age period is an ideal time to assist children in developing effective coping skills before the physical and psychological turbulence of adolescence (Hampel & Peterman, 2006) and transition to middle school (Rudoph, Lambert, Clark, & Kurlakowsky, 2001).

Despite the suspected deleterious relationship between stressors and physical and psychological health, a paucity of research exists on potential interventions to guide nurses within the school environment. Interventions may focus on the appraisal process and increase the ability to generate a variety of coping strategies that may fit the specific

stressful encounter. Programs for middle school children should provide opportunities to learn without comparison with peers, and with a chance to control the type and rate of learning, encouragement of respect for all children, and emotional and social support (Eccles, 1999).

Mindfulness-Based Stress Reduction (MBSR) is an intervention that involves the process of appraisal of stress and the use of coping resources. The MBSR program encourages a supportive, nonjudgmental, respectful environment and recognizes individual learning styles and skills. Mindfulness-based stress reduction is a training program of awareness based practices, including mindfulness meditation and mindful Hatha yoga. It was created by Kabat-Zinn in 1979 at the University of Massachusetts Medical Center as training to relieve suffering, chronically stressed adults (Kabat-Zinn, 1990/ 2005). Changing the appraisal of the stressor, and modifying the emotional reaction to the experience (Hayes & Feldman, 2004) may lead to improved clarity of mind and enhanced sense of control and flexibility in generating effective coping strategies (Salmon et al., 2004). Mindfulness increases awareness of feelings and thoughts as they arise. The awareness and recognition of stress is a prerequisite to generating adaptive coping responses (Salmon et al., 2004 p. 436).

Mindfulness-Based Stress Reduction trains individuals to recognize when the stress process is beginning and consciously respond, rather than to react with the usual unconscious, habitual, cognitive, emotional, and physiological reactions. The habitual automatic reactions may cascade to a detrimental physiological and emotional state of hyperarousal which may hinder the ability to generate a repertoire of effective coping

strategies (Kabat-Zinn, 1990/ 2005). The practice of mindfulness meditation may affect control beliefs (Dobkin, 2008). The development of mindfulness is a skill of particular importance in childhood when foundations of life long health habits are being formed.

Mindful movement based on yoga is a component of the MBSR program. Mindful movement combines breath and postures to decrease stress, increase mindfulness, improve fitness, flexibility, and mood (McClafferty, 2007). Positive psychological outcomes in adults were most closely correlated with the yoga portion of MBSR program than the other mindfulness training techniques (Carmody & Baer, 2007).

Yoga is comparable to a low level physical activity similar to a treadmill (Hagins, Moore, & Rundle, 2007). Exercise trials have also demonstrated short term positive effects on self-esteem in children and adolescents (Ekeland, Heian, & Hagen, 2005). Physical activity programs for children need be fun and promote behaviors that are likely to persist into adulthood (Nowicka, 2006).

Despite encouraging support for MBSR and yoga in many adult clinical and non-clinical populations with a variety of health and psychological issues, the feasibility and efficacy of MBSR with children has had little empiric exploration. Yet, children have demonstrated the ability of sustained attention (Benson et al., 2000), and learning mindfulness (Wall, 2005), and yoga (Galantino, Galbavy, & Quinn, 2008). Children have also developed the cognitive abilities such as self reflection and concentrative skills necessary for MBSR (Eccles, 1999).

Significance of the Problem

The ability to manage stress is a skill associated with pressing public health priorities by the Healthy People 2010 goals to reduce the incidence and effects of chronic diseases such cardiovascular disease, cancer, diabetes, obesity, and arthritis. Priorities for adolescents and children include the reduction of substance use, decreased suicide, and increased safety (Healthy People 2010, 2005). Stress may affect the magnitude of these chronic conditions.

The initial physiologic neuroendocrine response to stress (allostasis) serves an adaptive purpose to maintain homeostasis. However, the prolonged and persistent stress reaction has a cumulative cost to the body (allostatic load) that produces pro-inflammatory and metabolic states (McEwen, 2005) which are associated with many of the diseases cited by the Healthy People 2010 priorities. The physical activity associated with mindful movement is necessary for childhood health and well being and prevention of overweight and obesity.

Many of the existing studies of childhood stress and coping have concentrated on describing stressors or coping strategies and further defining a conceptual model of stress and coping in childhood. These descriptive studies include boys and girls together (Ryan-Wenger et al., 2005; Sharrer & Ryan-Wenger, 2002; Skybo, 2005), despite evidence suggesting fundamental gender differences in appraisal and coping, such as maladaptive coping (Hampel & Peterman, 2006).

The ability to manage stress effectively promotes health, prevents disease, and improves quality of life, congruent with the purpose of nursing and areas of emphasis for

nursing research indicated by the 2006 to 2010 Strategic Plan of the National Institute of Nursing Research. Mind-body therapies focus on engaging the power of thoughts and emotions which may positively affect physical health and may help children enhance feelings of control (McClafferty, 2007).

A recent systematic review of 16 empiric studies of sitting mediation for children and adolescents suggests sitting meditation as a possible effective intervention for physical and behavioral issues that warrants further investigation (Black, Milam, & Sussman, 2009). The possible role of contemplative practices within public school settings is also gaining attention as part of child development that may enhance learning (Jennings, 2008).

Mindfulness is also recognized as a potential addition to nursing education to decrease stress and anxiety of nursing students (Kang, Choi, & Ryu, 2009) and for enhanced communication skills, empathy and less burnout among primary care physicians (Krasner et al., 2009).

Mind-body interventions, such as MBSR, are congruent with nursing and the holistic view of persons as dynamic and contextual beings. Nursing focuses on wellness, quality of life, and physical and emotional healing (American Holistic Nurses Association, 2007; American Nurses Association, 2003). Knowledge development in nursing recognizes the mind-body connection, which makes an intervention such as MBSR consistent with emerging nursing knowledge. For example, nursing theorists, Roy and Watson, have redefined their previous theoretical assumptions to reflect the expanding paradigmatic view of health including philosophical assumptions of energy

patterns, consciousness, and awareness. Roy redefines adaptation to reflect a process and outcome by identifying a person as thinking and feeling, with the ability to use conscious awareness and choice to integrate person and environment (Roy, 1997). Newer nursing theories such as the Theory of Integral Nursing defines its core concept as healing, which is defined as an innate phenomena of indivisible wholeness, an interconnectedness of all things (Dossey, 2008). Mindfulness-based stress reduction is an acceptable intervention for stress reduction for nurse-centered patient care (Praissman, 2008) and health promotion (Beddoe, Yang, Kennedy, Weiss, & Lee, 2009). Health is enhanced by an approach that includes mind-body therapies.

School nurses are in a unique role as the identified health experts within the school environment. Nurses are often the professionals to whom children turn when suffering from stress-related symptoms (Larsson & Zaluha, 2003). This presents an ideal opportunity to teach children lifelong health skills and develop the tools necessary to effectively deal with inevitable stressful life experiences. However, evidence-based interventions for stress in school-age children are scant, contributing to missed opportunities for preventing illness and promoting physical and mental health.

The school is an ideal location to assist children in developing skills, as many of the reported stressors such as peer rejection, peer pressure, bullying, academic challenges, and conflict with teachers occur within the school setting (Brobeck et al., 2007; Carter et al., 2006; Horowitz et al., 2004; Larsson & Zaluha, 2003;). School-based stress reduction programs have reported large effect sizes in reducing stress and enhancing coping skills (Kraag, Zeegers, Kok, Hosman, & Abu-Saad, 2006).

Purpose of the Study

The purpose of this research was to study the efficacy and feasibility of a stress reduction program using mindful movement as a strategy to decrease levels of perceived stress, facilitate coping, enhance self-esteem, and enhance self-regulation in school-age girls.

Definition of Terms

The terms used throughout this study included the following:

Autonomic Nervous System is the part of the nervous system that controls most internal functions of the viscera in the body. It consists of two major branches, the sympathetic and parasympathetic. Both are responsible for excitement in some organs and inhibition of others (Guyton, 1956/1986).

Coping Strategies are actual conscious and purposeful efforts by the individual to manage stress (Lazarus & Folkman, 1984). Coping includes conscious, volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful circumstances (Compas, 2001). For the purpose of this study, coping strategies were what the child actually thought or did to manage a stressful situation. The number of coping strategies was measured by the Schoolagers' Coping Strategies Inventory.

Coping Effectiveness is the extent to which coping was perceived to have achieved the desired goals as measured by the Effectiveness subscale of the Schoolagers' Coping Strategies Inventory.

Coping Frequency is how often particular coping strategies were used measured by the frequency subscale of the SCSI.

Mindful Movement (Hatha Yoga) as a component of MBSR consists of gentle, slow postures coordinated with breathing to facilitate mindfulness. It was measured by the number of sessions attended and reported days of home practice.

Mindfulness-based Stress Reduction (MBSR) is a program utilizing formal and informal mindfulness practices as learned techniques to intentionally regulate one's attention and reaction to stimuli. Mindfulness is a state of nonjudgmental moment to moment awareness of anything that enters the current field of awareness.

*School-age girl*s are between the ages of 8-11 years attending fourth and fifth grade in Massachusetts public schools.

Self-esteem is the self-perception or self-worth reflecting how much the individual likes himself or herself as a person. This was measured by the Global Self-Worth subscale of the Self Perception Profile for Children (Harter, 1982).

Self-regulation includes the responses that attempt to modify, change, or redirect thoughts, emotions, or physiological reactions (Compas, 2001). This was measured by the Healthy Self-Regulation subscale of the Mindful Thinking and Action Scale for Adolescents (West, 2008).

Stress is the constantly changing result of one's appraisal of an interaction as a harm, threat, or challenge that is perceived to exceed a person's available resources measured by the Feel Bad Scale.

Stressor is the person-environment encounter that the individual appraises as taxing or exceeding his/her resources or as a threat to personal well-being (Lazarus & Folkman, 1984). For the purpose of this study, a stressor was the child's perception of a situation that makes her feel bad, nervous or worried as measured by the Feel Bad Scale (Lewis, Siegel, & Lewis, 1984).

Assumptions

Throughout the study it was assumed that:

1. School-age girls are able to focus and switch sustained attention.
2. The detection of symptoms of a stress reaction is a prerequisite to generate and utilize effective coping responses (Salmon et al., 2004 p. 436)
3. The cycle of automated stress reactivity can be modified by conscious awareness of the process as it is occurring.
4. School-age girls are able to notice subtle feelings and thoughts.
5. Mindfulness requires persistence and sustained practice.
6. School-age girls are able to practice mindfulness training 6 days each week.
7. School-age girls will follow the homework instructions and fill out the instruments.

Delimitations

This study was limited to fourth and fifth grade girls attending Massachusetts public schools. Inclusion criteria consisted of students: 1) willing to participate in a weekly class for the length of the intervention; 2) willing to complete daily homework six days each week; 3) able to speak, read, and write the English language; 4) pay attention for one

hour; and 5) able to participate in physical poses. Students with a history of formal mindfulness or yoga training or a developmental disorder as determined by the need for special education one to one assistance were excluded from the study.

Limitations

Because of the school setting, gender and limited age and demographics of this volunteer sample, the results of this study cannot be generalized beyond the participants.

Research Questions and Hypotheses

Research Questions

The following research questions were addressed:

1. To what extent do school-age girls who participate in an eight week mindful movement intervention report significantly different levels of perceived stress, effectiveness and number of coping strategies, levels of self-esteem, and self-regulation than girls in a wait-list control group?
2. To what extent is the dose of mindful movement inversely correlated with perceived stress and positively correlated with effectiveness and number of reported coping strategies, self-esteem, and self-regulation in school-age girls?

Hypotheses

The following hypotheses were tested:

1. School-age girls who participate in mindful movement stress reduction will report significantly less perceived stress, significantly greater effectiveness and number of coping strategies, significantly greater self-esteem, and significantly

greater self-regulation than school-age girls who participate in a wait-list control group.

2. The dose of mindful movement is inversely correlated with perceived stress and positively correlated with effectiveness and number of coping strategies, self-esteem, and self-regulation.

CHAPTER TWO

Theoretical Framework

The theoretical framework of this study was based on the evolution of the original stress, appraisal, and coping theory of Lazarus and Folkman (1984). Lazarus' (1993, 2006) later work added to the earlier theory by relating the concepts of stress and coping with emotion. This is consistent with the conceptualization of childhood stress and coping, which views coping as part of a larger process of self regulation (Compas, 2001; Skinner & Zimmer-Gembeck, 2007).

The work of Lazarus and Folkman (1984) emphasizes the individual differences between people managing similar situations as a result of individual cognitive appraisals. Cognitive appraisal is the process of reconciling the demands, constraints and resources of the environment with the goals and beliefs of the individual (Lazarus, 1993). This process includes a continuous categorizing of the meaning of encounters and the significance of its impact on the well-being of the individual. The ability to modify the appraisal process may enhance the ability to reshape the stress reaction into a conscious response that may affect the outcomes of the appraisals.

Primary appraisal is the process of how a person evaluates the risk of the stressor to one's goals, beliefs, and values. The stressor is the encounter that generates a cognitive evaluation by an individual. The stress reaction and associated emotions are generated if the individual appraises the stressor as a harm or threat to one's beliefs and goals. Emotions reflect how a person feels about how the situation affects him/her

(Lazarus, 2006). Specific emotions have a core relational theme which represents the significance of the interaction (relational meaning). For example, a person in a fight may appraise the core relational theme as “a demeaning offense against me and mine”, which is related to the emotion of anger (Lazarus, 1993 p. 13). However, the other person in the same fight may appraise the meaning of the situation as “facing uncertain, existential threat”, which is related to the emotion of anxiety (Lazarus, 1993 p.13). The meaning of the situation reflects the individual’s appraisal. The appraisal of the situation leads to the coping response.

Secondary Appraisal is the cognitive evaluation of available coping options and the likelihood of utilization and effectiveness of those options. The individual’s coping strategies, risks, material resources, social resources, and internal resources, such as intelligence and health are cognitively evaluated by the individual throughout the encounter (Lazarus & Folkman, 1984).

Coping shapes emotions and psychological stress by affecting how the situation is appraised (Lazarus, 1993). If coping is effective, then stress is modified and under control. If coping is ineffective, stress may cascade into deleterious effects in health, moral (emotional), and social (work) functioning (Lazarus, 2006). Therefore, the presence of stress is not as important to a person’s well-being as how the individual copes with the stress (Lazarus, 2006). This may be particularly important in childhood when many stressors are not subject to a child’s control. Coping is also a central part of the

emotional process. Emotions are related to the level of physiological arousal from a stressful encounter (Lazarus, 2006).

The physiological arousal to stress is adaptive as a short-term reaction, but can become deleterious if prolonged (McEwen, 2005). Emotional reactions that are particularly intense may interfere with cognitive reasoning. Attention and concentration are needed to effectively manage a stressful encounter. Mandler (1984) reports when emotions are experienced, attention is drawn from the current cognitive engagement. Therefore, emotional regulation is one of the functions of coping and affects the appraisal process (Lazarus, 2006).

The process of primary and secondary appraisal is part of a dynamic, continuous evaluation of an experience. Throughout an encounter new information leads to a reappraisal of the situation. However, appraisals of a situation may not accurately reflect reality. If the individual perceives a risk, fear or anger is a plausible reaction regardless of whether the risk actually exists. The ability to appraise the reality of the situation and choose effective coping strategies influences the outcome of the encounter (Folkman, 1984).

Coping is the attempt to manage stress independent of the outcome. The outcome of coping is the effect of the coping strategy. The coping function is the purpose the strategy serves, such as altering the perceived environmental cause (problem-focused) or influencing the emotional response to the problem (emotion-focused) (Lazarus & Folkman, 1984).

Problem-focused coping strategies include actions, such as problem-solving through external or internal actions to change the stressor. This may include strategies to change the perceived barriers, resources, or procedures causing the perceived threat. Strategies directed internally may include motivational or cognitive changes such as changing standards of behavior or learning new skills and procedures (Lazarus & Folkman, 1984).

Emotion-focused coping strategies are directed at the individual's emotional reaction to the stressor, rather than to change the external stressor. Cognitive strategies may lessen emotional distress, or change the way the encounter is interpreted without changing the objective situation such as telling oneself, "there are more important things to worry about" (Lazarus & Folkman, 1984 p. 150). Behavioral strategies such as meditation, exercise, and seeking emotional support are forms of emotion-focused coping.

The effectiveness of either type of coping may be related to the perceived controllability of the stressor. Lazarus (1993) states that rather than isolate one type of strategy over another, both problem-focused and emotion-focused strategies can impede or facilitate each other and the coping process. The strategies work best when used together within a stressful interaction (Lazarus & Folkman, 1984). The appraisal process is affected by cognitive, emotional, and social development that may vary in childhood.

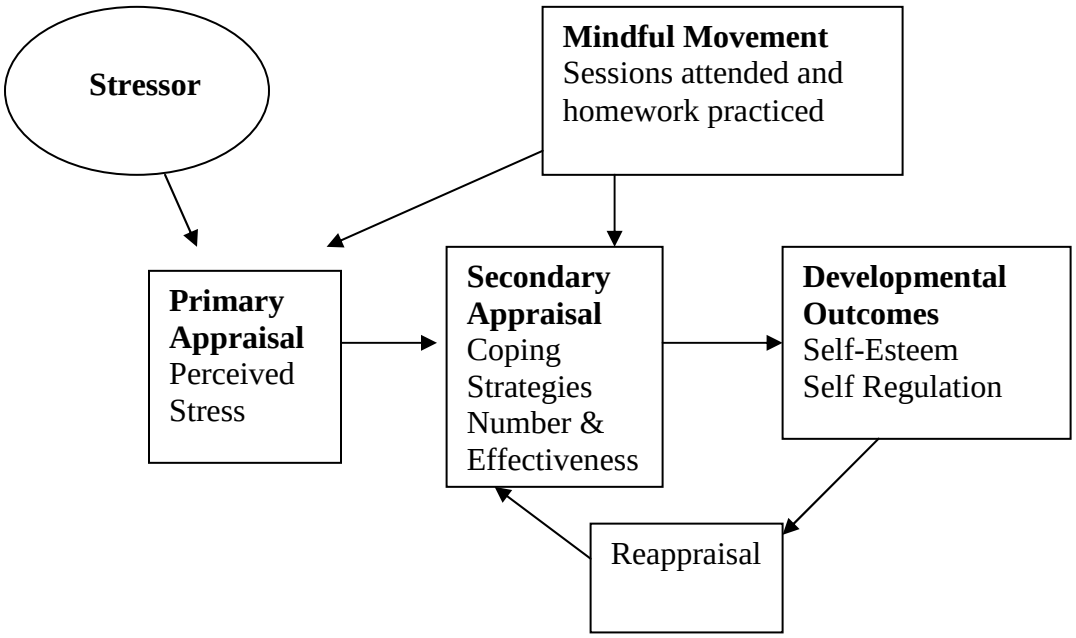

Figure 1. *Theoretical Framework and Proposed Study Variables*

Conceptualization of Coping in School-age Children

The definition and conceptualization of stress and coping in the school-age period remains inconsistent. Conceptualizations of coping reflect the cognitive appraisal, motivational and goal-directed model of coping as part of a self-regulatory process consistent with Lazarus' later work (1993, 2006). Despite the variation in cognitive

ability of school-age children, evidence supports the ability of school-age children to cognitively appraise encounters and generate and evaluate a variety of coping strategies (Huang & Menke, 2001; Ryan-Wenger, Sharrer, & Campbell, 2005; Sharrer & Ryan-Wenger, 2002; Sharrer & Ryan-Wenger, 1994; Taxis, Rew, Jackson, & Kouzekanani, 2004; Skybo, 2005; Walker et al., 2006). However, the harm or threat and controllability of the stressor need to be appraised accurately and a variety of coping responses produced throughout an encounter to effectively manage stress.

The coping process involves cognitive and social development, self-regulation, and stress reactivity. Compas (1998) defines coping in childhood as "volitional efforts to regulate emotion, cognition, behavior, physiology and the environment in response to stressful events" (Compas, 2001p. 89). Regulation refers to responses that attempt to modify, change, or redirect thoughts, emotions, or physiological reactions (Compas). The child's developmental level affects the child's available resources by enhancing or limiting the types of coping responses possible for the child (Compas). The response to a perceived threat experienced as stressful is processed at an automatic, physiological level, and a volitional, cognitive level.

Involuntary and volitional reactions to stress emerge differently over the course of development. Involuntary reactions may develop before the emergence of voluntary responses that develop in early childhood. While described as distinct processes, the involuntary and volitional responses interact within a stressful encounter (Compas, 2001).

The involuntary reaction to stress reflects individual differences in physiology and emotion. The autonomic nervous system reacts automatically, yet the characteristics of reactivity may vary with the specific emotions (Compas, 2001). This is consistent with Lazarus' (2000) theory that emotions have different meanings and qualities, but are related to physiological reactions. According to Compas (1987), the involuntary physiological reactivity to stress may inhibit or facilitate the coping response. The emotional and physical reaction may hinder attention and problem solving.

Encounters occur within an interaction between the individual and the environment. The perception of a stressor as a harm, threat, or challenge is related to the individual's cognitive appraisal and emotional meaning. The immediate emotional reaction to a stressful encounter is related to physiological arousal that may be regulated by coping. The constantly changing encounter results in multiple reappraisals and the necessity for multiple and flexible coping strategies.

School-age children cognitively appraise stressors and generate various coping strategies to manage these encounters. Coping in childhood is conceptualized as a self-regulatory process. Children, like adults experience automatic as well as volitional responses to stressful encounters. Children are often confronted with situations that are not under their control and face developmental challenges that further tax their available resources. While no one coping strategy is adaptive for every situation or individual, the ability to appraise stressors effectively and the ability to change coping strategies throughout an ever-changing encounter may be most effective in managing stress.

Interventions that promote appraisal and approach coping as a self-regulatory process may enhance the development of effective coping strategies that facilitate the adaptive management of daily stressors. The practice of mindfulness through the MBSR program has demonstrated changes in perceived stress in adults (Carmody & Baer, 2007). However, mindfulness has not been approached from a developmental perspective in relation to the cognitive, psychosocial, and physiological growth of school-age children. The abilities of the developing child need be considered when exploring methods to reduce perceived stress and enhance coping strategies within the individual differences in children. School-age children are developing individual differences such as self-esteem (Harter, 1999) that need to be considered in the process of managing stressful encounters within normative growth and development.

The school-age period is an important time to introduce skills for managing stressful encounters and building developmental assets. Patterns of behavior that influence the appraisal process and enhance the use of multiple coping strategies learned prior to adolescence may be important assets to protect children from the multiple stressors of adolescence and the increased physiological stress reactivity noted in adolescence (Gunnar, Wewerka, Frenn, Long, & Griggs, 2009; Stroud et al., 2009).

Literature Review

Daily Stressors of School-Age Children

The impact of acute or traumatic life events such as divorce, poverty, violence, homelessness, and illness on the physical and psychological well being of children has

received attention in the literature (Dubow, Edwards, & Ippolito, 1997; Huang & Menke, 2001; Sandler, Tein, Mehta, Wolchik, & Ayers, 2000; Sorgen & Manne, 2002; Skybo, 2005). However, the frequent, seemingly innocuous stressors commonly encountered by individuals are a more accurate predictor of future psychological symptoms (Wagner et al., 1988). The daily stressors encountered by children may be related to academic life, peer or family relationships, transitions, and developmental changes.

School-age children experience many stressors within their daily lives. Lewis, Siegel, & Lewis (1984) noted that most visits to the school nurse were by children without chronic medical conditions. The teachers and nurses perceived the visits to be related to social and emotional issues. The subsequent development of psychological counseling services reduced the number of visits to the nurse by 60%.

In response to this finding and to understand the nature of childhood distress, individual interviews and small group sessions were conducted with 50 to 60 fifth and sixth grade students. The children were asked what makes them feel bad, nervous or worried to elicit the identification of negative psychological states. The stressors reported by the children are listed in Table 1 (left column). The stressor items were created into a scale measuring the occurrence, frequency and appraisal of “badness”, which was then given to 2,400 fifth graders within a school setting. The children appraised the stressors they had not experienced with the greatest “badness” score, suggesting that the anticipation of an event may be more stressful than the actual occurrence of the event. It is, however, unclear what feeling bad, nervous or worried actually means to children. The

use of these terms may reflect sub-clinical or mild states of anxiety or depression in children that are not detected by mental health screening tools (Lewis et al., 1984). Therefore, the absence of psychopathology may not preclude the presence of a stressful condition.

These stressors were identified by and tested on primarily white children. Difference in the frequency and the distressfulness of the stressors were noted with other ethnic groups (Lewis et al, 1984). For example, Miller, Webster, & MacIntosh (2002) reported stressors specific to urban African American adolescents. The stressors included experiences with violence, drug use, and worries about safety. School-age children and young adolescents experience daily stressors, but the specific stressors may not be generalized across ethnic, cultural, socioeconomic groups, or geographical location.

Current research supports the presence of childhood stress and the ability of school-age children to identify daily stressors. A list of stressors was generated by 194 primarily (87%) white children through group discussion with second and third grade children and questionnaires for the fourth, fifth and sixth grade children (Ryan-Wenger et al., 2005; Sharrer & Ryan-Wenger, 2002). The stressors are listed in Table 1 (right column).

Table 1. *Stressors Reported by School-Age Children*

Lewis et al., (1984)	Ryan-Wenger et al., (2005)
Parental separation	Tests
Peer pressure	Homework
Parental arguing	Being made fun of
Not spending enough time with parents	Bad grades
Feeling sick	Not feeling good or feeling sick
Fighting with parents about house rules	Getting in trouble
Not having homework done on time	Worried about a family member
Moving homes	Doing something embarrassing in front of others
Not getting along with the teacher	Parent mad or yells at me
Being overweight	Fighting with friends
Being bigger or smaller than others of the same age	Death of someone close
Changing schools	Being bullied
Feeling left out of a group	Feeling left out
Not having enough money	Getting hurt by accident
Not able to dress the desired way	Brother or sister fights with me
Having nothing to do	
Feeling pressured to get good grades	
Not being good enough at sports	
Being late for school	
Feeling like your body is changing	

Children between the third and eighth grades responded with situations they appraised as stressful. The sample of 777 primarily white children was given an open-ended questionnaire asking about the worst thing that happened lately. The responses were similar to the previous studies except for the addition of being bullied and the death of someone close. The children were able to identify stressors that occurred in the past or anticipated in the future (Ryan-Wenger et al., 2005).

An exploratory and descriptive study based on a phenomenology of twenty-nine 11-12 year old children used semi-structured tape-recorded interviews to discover how

school-age children experience stress in their daily lives. The interview began by asking whether the children were familiar with the term stress, and then asked them to describe stress and the meaning of stress to the individual child. The five resulting themes were: (a) fear of being late, (b) not having sufficient time, (c) physical and mental consequences, (d) a positive and a negative feeling and (e) experiencing a significant other's stress. Not having sufficient time was described as "too many things in your head, loads of different things to do, which makes you feel as if you would like to disappear …" (Brobeck et al., 2007, p. 5).

Children associated stress with being harmful for the body and feeling bad. However, stress was also described positively as an incentive for extra effort, but only if they could think clearly. The children were able to identify stress and its related effects in themselves and in a parent or friend (Brobeck et al., 2007). Parental stress was perceived more negatively by children than a friend's stress. Parents perceived as stressed by children were described as more easily angered. The children reported not feeling able to help their parents (Brobeck et al.).

An earlier phenomenological study explored the meaning of stress through interviews with 14 children in children examined fourteen 9 to11 years of age. Seventeen categories of situations were identified. The categories were represented by three dimensions of experience including feelings of loss, feelings of threat of self, and feelings of being hassled. The interviewer began by stating that "many times children find themselves in situations where they don't know what to do, or they have times when what

they usually do doesn't work for them. "Think about a time when you felt something like that, and then draw a picture of that experience" (Jacobson, 1994, p. 96).

Each child was interviewed twice. Drawing was only used by the children as a method for accessing their feelings and memories, and to build rapport with the interviewer. All the children reported feeling "hassled", but none of the children thought of seeking help. They spoke of the hassles as expected, uncontrollable occurrences. The number of daily stressors was the basis for the children's classification of a good, bad, lucky or unlucky day (Jacobson, 1994).

Stressors identified from children's perspectives may differ from the external observations of the children by adults. Parents or adults observing children may underestimate children's stress appraisal. For example, in order to assess perceptions of stress, children from kindergarten through third grade and their parents were given a questionnaire of twenty scenarios of daily stressors and major stressful life events (Bagdi & Phister, 2006). The children reported significantly higher levels of stress than the parental report of the children's stress. The experience of stress may best be reported by the individual's perception. Internal feelings of stress may not be obvious to others.

School-age children are able to identify and appraise stressors, describe feeling hassled or stressed, and report positive and negative effects of stress. However, cognitive appraisals are related to the cognitive, emotional and social development of the child.

Cognitive Development

The ability of children to appraise a situation, generate, and evaluate coping strategies is related to cognitive, social, and emotional development as the child engages with the world outside of the family. Opportunities for social comparison, feedback from others, and exposure to vast new experiences are accompanied by cognitive changes that affect appraisals and the development of self concept (Eccles, 1999).

By 7 to 11 years of age children are capable of concrete operational thought including logical reasoning, cooperation, mutual respect and the ability to classify objects based on more than one feature (Piaget & Inhelder, 1969; Whitener, Cox, & Maglich, 1998). Children at 11 years of age may demonstrate formal operational thought that is more abstract and allows a greater understanding of reality, greater logical reasoning, and the ability to abstractly test different ideas and plans (Piaget & Inhelder, 1969). By middle to late childhood, language, metacognitive thought, intentionality, and delayed gratification enhances problem solving and allows broader responses to emotional arousal (Compas, 2001). The cognitive abilities are needed to accurately appraise stressors, recognize thoughts and feelings focus attention, and generate a greater variety of coping strategies. The ability to regulate behavior and emotion is related to increased peer-rated social status, capacity for empathy, decreased behavior problems, and fewer negative emotions (Compas, 2001).

Concentrative skills and information retrieval enhance the ability to solve novel problems and cope with new situations. School-age children are able to set goals and

modify actions if deemed necessary to meet those goals. School-age children consciously plan, coordinate, and evaluate their progress through self reflection (Eccles, 1999).

The development of self awareness takes place within a peer group with its own structure, goals, and conflicts as children learn to consider others' perspectives. The ability to reflect on one's successes and failures through social comparison affects perceived competence (Eccles, 1999). Self evaluation regarding perceived competence in developmental domains affects how children feel about themselves and their self-esteem (Harter, 1982).

Development of Self-esteem

The development of self-esteem lacks an overarching theoretical framework (Robins & Trzesniewcki, 2005). However, Sonstroem and Morgan (1988) report that one's concept of the self is considered by some researchers as the strongest variable reflecting psychological gains. Middle to late childhood is a period of development that is driven by the need to achieve competence, autonomy, and relatedness. New opportunities provide experiences to master new culturally-defined skills. Feelings of competence and self-esteem are necessary for a sense of well being (Eccles, 1999).

School-age children tend to be grouped together in same age classrooms and sports teams that facilitate the comparison of oneself with same age peers. Competition and social comparison influence self concept. The experience of whether or not children master skills is the primary developmental challenge of industry versus inferiority in social development (Erikson, 1950/1963). Perceived successes lead to a positive view of

oneself that may be associated with a positive view of learning. Therefore, new experiences are more likely to be appraised as a challenge. Children who do not master culturally valued skills may experience inferiority and may be at risk for future psychological, emotional, and intellectual problems (Eccles, 1999).

The perception of competence may be more important than actual competence in a task. For example, early adolescents (12 years of age) who described themselves as competent in sports reported fewer emotional or behavioral problems compared with those adolescents rated competent by external raters (Donaldson & Ronan, 2006).

The development of self-esteem occurs throughout the life span with periods of relative stability as well as upheaval. In early childhood children tend to report a high level of self-esteem. Unrealistic views of the self and little critical external feedback enhance this positive self view (Robins & Trzesniewcki, 2005). School-age children and are exposed to more negative external feedback, social comparison, and self evaluation which reflects a more realistic self view. Lower levels of self-esteem are reported throughout adolescence and are stable into adulthood (Robins & Trzesniewcki, 2005). However, self-esteem during middle childhood is less stable and therefore potentially amenable to intervention. No gender difference is reported in the trajectory of self-esteem development. However, girls report lower levels of self-esteem than boys during adolescence and adulthood (Robins & Trzesniewcki, 2005).

The multiple stressors of childhood place children at risk for low self-esteem (Eccles, 1999). Self-esteem my influence stress appraisal and coping. Low self-esteem

may enhance unrealistic appraisals that overestimate the negative impact of a stressor, especially if the child attributes an important meaning to the stressor (Kliewer & Sandler, 1992). Harter (1986) suggests that children with higher self-esteem tend to use more effective mechanisms to manage threats. For example, self-esteem was found to mediate the relationship between the stress and internalizing symptoms in parentally bereaved 8 to 16- year- olds. The authors suggested that negative life events may reduce self-esteem, which is then associated with psychopathology (Haine et al., 2003). Harter (1986) and Pope, McHale and Craighead (1988) suggest that girls need strategies to maintain self-esteem when confronted with stressors by learning how to reevaluate the implication of the stressor for self-esteem. Self-esteem was found to buffer the effects of stress such as asthma or divorce on psychological symptoms, but only in girls (Kliewer & Sandler, 1992).

Control and Coping.

The generation of coping strategies is related to perceived controllability of the stressor. Rothbaum, Weisz, & Snyder (1982) describe a two-process model of control, including primary and secondary control strategies which may both serve different, but essential purposes in managing a stressful situation. Primary control involves the attempt to change the environment and tends to be used if the individual perceives he/she has the power to change the situation. Secondary control is an attempt to change the individual to fit the environment and may be used when attempts at primary control have failed or if a more powerful agent or other is perceived.

The use of primary control strategies may not be optimal if the situation is actually out of the control of the child. Equally ineffective is the use of secondary control strategies when a situation is actually controllable. Adjustment or adaptation may require a balance between primary and secondary control strategies and the knowledge of when to use either or both primary and secondary efforts (Rothbaum et al., 1982).

The perceived controllability of a stressor and subsequent coping strategies has been demonstrated to affect outcomes (Band & Weisz, 1990; Rothbaum et al., 1982; Weisz, McCabe, & Dennig, 1994). The effectiveness of coping strategies may depend on the match between appraisals and the flow of events. If there is not a match between appraisal and the actual events, the person may appraise harm, threat, challenge, or uncontrollability when they do not apply. The converse is also possible and the individual may fail to recognize harm, threat, or challenge when they do apply (Lazarus & Folkman, 1984). To be effective, the appraisal of control needs to be accurate (Folkman, 1984).

To determine the goodness-of-fit hypothesis, defined as the match between appraisals of control and coping behaviors, 76 children and adolescents with a diagnosis of cancer were asked to identify stressors and report on a five point Likert scale how much control they perceived they had over the stressors. The children who did not match coping strategy and perception of control reported higher distress scores than those children who matched their coping strategies with their appraisals of control. The use of the emotion-focused coping strategies in the perceived lower-control situations predicted

lower distress, suggesting that some children are affected by the match of coping strategies to the appraisal of perceived controllability. (Sorgen & Manne, 2002).

Age moderated the relationship between coping and control. Only the older children matched their coping effort to their perceptions of control. Both groups used problem-focused coping strategies for the situations perceived as controllable, but there was a stronger relationship in the older group of children (Sorgen & Manne, 2002).

The dominance of specific coping strategies in responses to stress may be related to age and perceived controllability of the stressors. Strategies that involve modifying one's emotions or distraction from a stressor (emotion-focused or secondary control coping) tend to increase with age. This most likely reflects the increasing ability of children to keep more than one thought in their mind simultaneously (Altshuler & Ruble, 1989).

Children are able to alter their cognitive state, control a thought, and are able to monitor a situation at the same time they are cognitively avoiding it. For example, older children may remain near arguing parents, while distracting themselves by reading a book or watching television. Younger children may not be capable of this cognitive duality and respond by complete avoidance of the situation by leaving the room or crying as an emotional release (Altshuler & Ruble, 1989). However, Marriage & Cummins (2004) demonstrated that children as young as five years of age were able to generate secondary control strategies (manage one's emotions) despite much of the extant

literature suggesting children of that age predominantly use primary control coping (modifying the stressful situation, such as leaving the room).

The incidence of secondary control coping increased with age in 66 children 5 to12 years of age while watching short videos of scenarios demonstrating an everyday stressful situation. The scenarios included another child saying something mean, going to the doctor to get a needle, and falling and getting hurt. The children were asked how they thought the child in the video was feeling and what the child in the video could think or do to make it feel better. To assess the goal of the suggested strategy, the children were asked how they thought the strategy would help to make it better and what else the child could do if he/she could not perform the suggested strategy. Primary control reflected an action aimed at modifying or influencing the situation. Secondary control reflected efforts to modify or influence the child's subjective psychological state (emotional distress). Relinquished control reflected an inactive response that failed to enhance reward or reduce punishment.

The younger children (5 to 8 years of age) used significantly more primary-control coping and less secondary control coping in the hypothetical scenarios that depicted an acute loss of control. The 9-12 year old children reported significantly more secondary-control coping strategies than primary control (Marriage & Cummins 2004). In earlier work, researchers Compas, et al. (1988) found problem-focused coping (similar to primary control) relatively consistent with age for 10-14 years old, while

emotion-focused coping (similar to secondary control) increased with age. Perceived controllability of stressors may be related to context as well as cognitive development.

Researchers Band and Weisz (1990) separated children with diabetes based on cognitive developmental level. One group included children with concrete operational thought and the other with formal operational thought. In the concrete operational group, perceived controllability of the stressor was the best predictor of diabetes-related adjustment. In the formal operational group, diabetes-related adjustment was related to cognitive knowledge and secondary control strategies. However, the specific secondary control strategies were either maladaptive (deleterious to diabetes health indicators) or adaptive (enhanced diabetes health indicators). Therefore, children may use secondary control coping to reframe a stressor and promote primary control coping or as a way to avoid an active role. Therefore, assumptions about the effectiveness of specific coping strategies can not be evaluated out of contextual outcomes.

Outcomes need to be evaluated related to the individual as well as the situation. People may report greater short term effects when using familiar coping strategies, but that may not serve the longer-term benefit of developing new strategies (Rothbaum, Weisz, & Snyder, 1982). The fit between the appraisals of controllability and the actual characteristics of the stressor and between the appraisals of controllability and coping need to be evaluated to best understand the coping process (Folkman, 1984).

The effectiveness of the problem-focused strategies depends on the success of the emotion-focused strategies to manage emotions (Folkman, 1984). This is supported by

qualitative research with school-age children, who report the need for clear thoughts to manage stress (Jacobson, 1994). The ability to modify or regulate the emotional reaction to stress requires both primary and secondary control strategies.

Development of Emotional Regulation

The ability for attentional control also plays a role in the coping response by allowing sustained attention to voluntarily shift, which allows coping strategies such as distraction from negative emotions (Compas, 2001). School- age children are able to regulate physiological, behavioral, and emotional arousal (Simonds, Kieras, Rueda, & Rothbart, 2007).

Coping as a form of emotional regulation assumes the ability of effortful control which modulates emotional reactivity. Effective effortful control results in the expression of emotions deemed as socially appropriate and the inhibition of emotions considered socially inappropriate (Eisenberg et al., 1997) by suppressing a dominant response in favor of a less dominant response (Rothbart, Ellis, Rueda, & Posner, 2003). When children are confronted with conflict, the ability of effortful control diminishes the emotional reactions and the resulting behaviors (Rothbart et al., 2003) thereby encouraging flexibility of responses. Effortful control is related to emotional regulation dependent upon the ability to voluntarily shift attention from an emotion-producing stimulus. Attentional efficiency is the foundation for socially appropriate emotions. Executive attention is the neurological network underlying the development of effortful control leading to emotional regulation (Simonds et al., 2007).

Botvinick, Braver, Barch, Carter, & Cohen (2001) demonstrated that the executive attention network involves the prefrontal cortex, anterior cingulate and basal ganglia. Tasks producing conflict in attention have been shown to activate the area of the prefrontal cortex and anterior cingulate. The development of the prefrontal network leads to voluntary control in choosing between cognitive and emotional stimuli focus (Rothbart et al., 2003). Effortful control that is integral to emotional reactivity increases with age (Valiente et al., 2003).

Kochanska and Knaack (2003) followed 106 children from infancy to 6 years of age through multitask behavioral batteries and found that effortful control appeared to be a personality trait by 45 month of age. However, evidence supports the ability to modify executive attention in children between 7 and 10 years of age. Simonds et al. (2007) investigated self regulation in 49 white 7 to10-year-old children using measures of effortful control, conflict task executive attention and a scenario of a mistaken gift to assess smiling as a socially appropriate response to disappointment. The conflict was elicited by an attention network test (ANT). The ANT is a computer task that monitors the reaction time between pictures. The pictures differ in presentation that may be categorized as congruent and expected interspersed with incongruent (unexpected) pictures that necessitates a change in attentional focus. A conflict score is obtained by subtracting the average reaction time of congruent pictures from the average reaction time for the incongruent pictures. A low score represents efficient executive attention. There was no significant correlation between the conflict scores on the first and second

ANT. The authors suggest that the session between the two administrations had executive attention tasks that may have trained the children in executive attention. Children developmentally can direct their attention and regulate emotions. This ability may be related to temperamental differences, but may also be amenable to attentional training.

Gender

The effect of gender on the perception of stress and associated coping strategies has been repetitively suggested in the literature. Girls are described as more likely to internalize their feelings and experience depressive symptoms. Girls are more concerned than boys with social relationships or social norms and expectations (Hampel & Peterman, 2006; Washburn-Ormachea, Hillman, 2004).

Studies that tested for a gender main effect are not consistent in their findings. However, in general, girls report greater interpersonal stress and use more social support and emotion-focused strategies (Griffith et al., 2000; Hampel & Peterman, 2006; Washborn-Ormachea, & Hillman, 2004; Burgess, 2006). Peer-related stressors have been reported to matter more to girls than to boys by self-report (Washburn-Ormachea, & Hillman, 2004). This may be related to girls appraising events differently than the boys.

Girls have not only reported more stressful experiences, but have also reported feeling more affected by these experiences (Griffith et al., 2000). In a hypothetical school situation assessing how one would feel if another child deliberately poured milk over "your back" in the cafeteria, girls were more likely to report feeling embarrassed. The boys were more likely to report feeling okay (Burgess, 2006). It was suggested that girls

may have a greater sensitivity to interpersonal stressors and an increased feeling for connectedness and nurturance (Chung & Asher, 1996). However, it is possible that girls were more likely to admit feeling embarrassed than boys due to social expectations (Burgess, 2006).

Girls have reported using more coping strategies than boys. This may be related to the girls' greater willingness to admit stress or possibly an increased perception of stress that leads to the necessity of coping strategies (Griffith et al., 2000). Emotion-focused strategies considered maladaptive, such as rumination, resignation, and passive avoidance and more anger-control and emotional distress problems were noted in 10-14 year old girls reporting interpersonal stress (Hampel & Peterman, 2006). Girls used more social supports as a coping response than boys. Girls also reported a strong reliance on social relationships, which may influence the appraisal of the interpersonal events as stressful. Self-esteem buffers the effects of stress for girls. The authors suggest that girls with higher self-esteem may be more accepting of positive messages and advice than girls with low self-esteem (Kliewer & Sandler, 1992). In general, adolescent girls report lower self-esteem than adolescent boys (Robins & Trzesniewcki, 2005).

Girls were also found to change coping strategies in family situations. When a family stressor is perceived as uncontrollable, girls are more likely to use avoidance strategies than when the family stressor is perceived as controllable. The boys did not change their coping strategies in relation to perceived controllability of the family stressor (Griffith et al., 2000).

The literature reports that gender differences exist in the appraisal of stressors and the use of coping strategies. Girls, in general, may appraise interpersonal situations as more important and more stressful than boys. Girls also may utilize more social supports and more emotion-focused strategies, or involuntary reactions such as rumination which may be more maladaptive and predispose girls to depressive symptoms (Papadakis, 2006).

Symptoms of Stress

School-age children are able to identify and articulate symptoms related to perceived stress that reflect physical, cognitive, and emotional factors and the effectiveness of coping strategies. To explore children's self-reported stress symptoms, Sharrer & Ryan-Wenger (2002) studied a sample of 194 children between 7-12 years of age. Information from second and third grade children was obtained from group discussion. The older children were assessed by questionnaire. The children reported a total of 507 symptoms that were inductively sorted into categories. The responses mentioned fewer than four times were omitted. Two major categories emerged. These included cognitive/emotional symptoms and physiological symptoms listed in Table 2. Despite using terms with generally recognizable meanings, the meaning of these terms were not further elaborated.

These cognitive and physiologic symptoms of stress were supported by a qualitative study of 11-12 year old children's perception of stress. The children reported physical and cognitive responses to stress listed in Table 2. (Brobeck et al., 2007).

However, the ability to associate stress or a psychogenic etiology for these somatic complaints may not adequately be developed in younger children.

To evaluate whether children between preschool and fifth grade are capable of attributing a physical experience to a psychological cause, 128 children were compared with adults. Questions such as “can you get a tummy ache from worrying” were asked by structured interview and questionnaire. There was a significant effect for age independent of past experience with stress. The children were able to distinguish mental from physical phenomena, but the younger children prior to fifth grade were not able to attribute a somatic complaint to a psychological cause possibly due to the inability to consider cross-domain interactions (Notaro, Gelman, & Zimmerman, 2001).

Despite these findings, school-age children are capable of identifying stressors and symptoms suspected to be associated with stress. The symptoms reported by children such as feeling hot, shaky, and feeling a fast-beating heart are consistent with the physiological responses to stress. However, in the absence of longitudinal or causal models, only a correlation between identified stressors and symptoms can be inferred. The ability of school-age children to appraise stressors and identify symptoms, thoughts, and feelings related to stress is the basis for generating coping strategies to manage stress. The symptoms reported by children reflect the underlying automatic physical and emotional reaction to a stress appraisal. The awareness of reactions to stress is required to generate coping strategies (Salmon et al., 2004).

Table 2. *Symptoms of Stress Reported by School-Age Children*

Cognitive/Emotional	Physiological
Being mad (angry)[a,b]	Headache [a,b]
Feeling worried [a]	Dizziness[b]
Feeling sad [a,b]	Stomachache [a,b]
Feeling nervous [a,b]	Butterflies in the stomach[b]
Feeling afraid [a]	Hearing heart beating fast
Feeling bad [a]	Feeling sweaty [a]
Feeling confused [a]	Feeling funny [a]
Feeling weird [a]	Feeling sick [a]
Thinking would die [a]	Feeling shaky [a]
Wanting to hit [a]	Feeling tired [a]
Feeling resentful[b]	Feeling hot or red in face [a]
Difficulty thinking clearly[b]	Feeling weak [a]
Decreased concentration[b]	Feeling tingling [a,b]
Increased forgetfulness[b]	Feeling hungry[a]
	Having chills or goosebumps [a]
	Having tight muscles [a]

Note. [a] Sharrer, V. W., & Ryan-Wenger, N. M. (2002). School-age children's self-reported stress symptoms. *Pediatric Nursing, 28*, 21-27.

[b] Brobeck, E., Marlund, B., Haraldsson, K., & Berntsson, L. (2007). Stress in children: How fifth-year pupils experience stress in everyday life. *Scandinavian Journal of Caring Science, 21*, 3-9.

Response to Stress

The response to stress includes both an automatic physiological and emotional reaction as well as a volitional response. The automatic physiological reaction to stress enables individuals to rapidly react to a stressful situation. While this serves an adaptive purpose, the prolonged exposure to physiological mediators may have damaging effects on physical and mental health. The effective management of stress includes the ability to enhance the protective, adaptive function of physiological mediators while diminishing their damaging effects.

The experience of stress needs to be conceptualized as a connection between the mind and body (McEwen, 2005). Recent advances in biological sciences render it impossible to separate behavior from biology (McEwen (2001). The brain and body are connected through the autonomic nervous system, endocrine, and immune systems that protect the body and facilitate the adaptation to stress (McEwen, 2005).

Psychological stimuli, especially novel, unexpected and uncertain situation exert a strong influence on pituitary-adrenal activity (LeMoal, 2007). The nervous system interprets the cognitive appraisal of a situation which determines the behavioral and physiological reaction to the stressor (McEwen & Wingfield, 2003). The individual response to stress is dependent on the interpretation of events in relation to the individual's goals, expectation, and defense mechanisms (LeMoal, 2007). The interaction between the automatic physiological reaction and volitional coping is needed to regulate the stress response.

Physiological Reaction to Stress

The physiology and behavior of an individual is maintained through a changing environment by homeostasis. Homeostatic mechanisms, such as pH, oxygen tension, glucose level, and body temperature are essential for life. Stressors further tax physiological stability and require extra energy or resources (Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004). Physiological stability and homeostasis is maintained by the process of allostasis (McEwen & Wingfield, 2003). While homeostasis is essential for life, allostasis maintains homeostatic systems through challenges, such as stress.

The primary mediators of allostasis in response to stress include the products of the hypothalamic-pituitary-adrenal (HPA) Axis , catecholamines from the sympathetic adrenomedullary system (SAM), and cytokines from the immune system (McEwen & Wingfield, 2003; Schommer, Dirk, Hellhammer, & Kirschbaum, 2003; Hellhammer, Schlotz, Stone, Pirke, & Hellhammer, 2004). While adaptive in the short term, these mediators take a cumulative toll on the body (Glei, Goldman, Chuang, & Weinstein, 2007; McEwen & Wingfield, 2003).

The Autonomic Nervous System (ANS) is the part of the nervous system that controls most internal functions of the viscera in the body. The ANS is activated by regions of the spinal cord, brainstem, hypothalamus, cerebral cortex, and limbic system (Guyton, 1956/1986). The two parts of the ANS are the sympathetic and the parasympathetic nervous system cause different effects on organs. The sympathetic ANS

predominantly produces norepinephrine that acts on alpha and beta adrenergic receptors (van Stegeren, Rohleder, Everaerd, & Wolf, 2006).

The sympathetic adrenomedullary system (SAM) connects pathways of the sympathetic nervous system to directly stimulate cells in the adrenal medulla to secrete epinephrine (Gold et al., 2003). Norepinephrine constricts blood vessels, inhibits the gastrointestinal tract, and dilates pupils leading to increased arterial pressure and increased total peripheral resistance. Epinephrine causes a lesser increase in arterial pressure, but greater cardiac output and increased metabolic rate and increased glycogenolysis (Guyton, 1956/1986).

The parasympathetic ANS primarily functions through the Vagus nerve. Like the sympathetic ANS, the parasympathetic ANS may cause excitement and inhibition in specific organs. The parasympathetic ANS constricts the pupil, decreases the heart rate and decreases the force of cardiac contraction (Olshansky, Sabbah, Hauptman, & Colucci, 2008). The parasympathetic ANS improves heart rate variability and reduces the resting heart rate (Olshansky at al., 2008).

The sympathetic ANS is stimulated during a stressful encounter (van Stegeren et al., 2006). During the stress reaction the sympathetic nervous increases arterial pressure, increases blood flow to muscles, increases metabolism, glycolysis, muscle strength, mental activity, and rate of blood coagulation (Guyton, 1956/1986). Both branches of the ANS may be integrated and work together. The parasympathetic ANS can affect the results of sympathetic activation. The heart and reactivity may be lowered by inhibition

of the sympathetic ANS or by the direct affect of the left Vagus nerve (Olshansky et al., 2008).

During acute stress the SAM and HPA Axis systems are activated by perceived psychological stress (Gold, Zakowski, Valdimarsdottir, & Bovbjerg, 2003). The behavioral response to stress and anxiety are able to exacerbate the mediators of the physiological response (Heim et al., 2000; McEwen & Wingfield, 2007). The SAM is part of the autonomic nervous system and releases the catecholamines, epinephrine and norepinephrine from the adrenal medulla (Gunnar & Quevedo, 2007).

The catecholamines enhance the blood supply to the brain and muscles, increase heart rate, cardiac output, muscular vasodilatation, vascular constriction in the skin and gastrointestinal tract. Epinephrine stimulates hepatic glycogenolysis and raises serum glucose to provide energy to the body. Norepinephrine is produced in the brain to enhance vigilance, arousal, focused attention, and activation of the HPA Axis (Gunnar & Quevedo, 2007). The HPA Axis system releases glucocorticoids from the adrenal cortex. The hypothalamus releases corticotrophin releasing hormone (CRH) and arginine vasopressin (AVP) to stimulate the anterior pituitary to release adrenocorticotropic hormone (ACTH) (Stratakis & Chrousos,1995). The ACTH stimulates the adrenal cortex to produce and release glucocorticoids (GC). Glucocorticoids act on target tissues by gene transcription so the effects are delayed and prolonged. Both chronically low and high levels of GC are related to poorer adaptation (Gunnar & Quevedo, 2007).

Allostatic Load

The unpredictable stressors in conjunction with predictable life changes create "transitional points" related to behavioral and physiological responses and coping ability to decrease the physical impact of allostasis (McEwen & Wingfield, 2003, p. 3). Coping responses result in a reduction of the cost to the body of the allostatic mediators. If this is not effective, the cost to the body becomes an allostatic load (McEwen & Wingfield, 2003).

Psychological stressors may activate the physiological cascade of a stress reaction through neural pathways. The sympathetic-adrenomedullary (SAM system), the HPA Axis, emotion, motivation, learning, and regulation are centrally modulated by the cortico-limbic pathways including the amygdala, hippocampus, and orbital/medial frontal cortex (Gunnar & Quevedo, 2007).

Information from the experienced event is sent from the hippocampus to the amygdala. The amygdala creates an emotional response. The hippocampus initially stores the conscious memories associated with the stress experience. The prefrontal cortex filters the information to generate cognitive and emotional responses (Weiss, 2007). This information is sent to the hypothalamus leading to the neuroendocrine response to stress via the HPA Axis (Weiss). The hippocampus releases gamma aminobutyric acid (GABA) to the hypothalamus (Gunnar & Quevedo, 2007). The hypothalamus produces corticotropic releasing factor (CRF) and arginine vasopressin (AVP) that acts on the pituitary to produce adrenocorticotrophic hormone (ACTH) that stimulates the adrenal

gland (Gunnar & Quevedo). The adrenal gland produces the glucocorticoid, cortisol, which supports metabolism, immune response, vascular tone, and homeostasis (Gunnar & Quevedo). Both the SAM and HPA Axis system depend on the relationship between the central nervous system (CNS) and the adrenal gland (Gunnar & Quevedo).

Allostatic Overload

The maintenance of this allostatic state requires energy (Goldstein & McEwen, 2002). The perceived demands provoke a physiological and emotional reaction that is to be maintained for a limited time. If the demand persists or is repeated, the emotional and physiological arousal increases and persists. The physiological reaction maybe sustained for a period of time with available energy. However, the increasing imbalance of allostatic mediators may become wearing on the regulatory systems of the brain and body (McEwen, 2005). Eventually, the feedback process is hindered (Le Moal, 2007). The repeated exposure to the mediators of allostasis inevitably leads to physiological damage and reflects “too much a of a good thing” (McEwen, 2005 p. 319).

The persistent secretion of glucocorticoids and products of the autonomic nervous system (ANS), and central nervous system (CNS) neurotransmitters may lead to an allostatic overload and pathology (McEwen & Wingfield, 2003). The allostatic load causes neural damage through the effects of cortisol and glutamate (Weiss, 2007). McEwen (1999) reports that the damage from moderate stress may be reversible, but neural death may result from severe and prolonged stress. The resulting allostatic load may be caused by multiple new stressors, lack of adaptation to the same stressors,

delayed termination of the stress reaction due to system over-activation, or inefficiency, or inadequate response that leads to hyper-activation of other mediators as compensation (McEwen, 2001).

Deleterious Effects of Stress Reactivity

Allostatic overload and pathology results when the situation exceeds the individual's ability to cope with a stressor (McEwen & Wingfield, 2003). The physiological reaction to stress leaves persistent changes on the brain associated with arousal and emotions (LeMoal, 2007). The prolonged activation of allostasis may exaggerate existing defects that create a positive feedback loop and overload of mediators (Goldstein & McEwen, 2002).

Problems associated with allostatic overload include dysregulation of glucocorticoid secretion which increases appetite and food consumption, insulin resistance, and increased deposition of fat and persistent hypertension leading to atherosclerotic plaques (McEwen & Wingfield, 2003). Cortisol and adrenaline initially increase immune function for several days, then suppress the immune response and increase the risk of infection (McEwen,2001).

The neurotransmitter serotonin initially induces a calming effect through the frontal cortex. Eventually, serotonin depletion may cause intrusive thoughts and an inability to dampen future emotional reactions to stressors (Weiss, 2007). Changes in brain structures are found in chronically stressed adults that are related to emotional

distress (McEwen & Wingfield, 2003) and more rapid physiological activation during a stressful encounter (Weiss, 2007; Gold et al., 2003; Heim et al., 2000).

Physiological Effects of Stress on Children

The mediators of the physiological cascade generated by stress have a greater impact on neural tissues during times of rapid growth by altering the pathways and organization of the developing brain (Gunnar & Quevedo, 2007). Patterns of stress reactivity may begin in childhood and early adverse experiences may affect future hormone regulation in adulthood (Sonino, Tomba, & Fava, 2007) and promote allostatic load in adulthood (McEwen, 2000). Henry, Kabaj, Simon, LeMoal, & Maccari (1994) report prenatal and neonatal environmental conditions may permanently alter the future response to stress and promote dysregulation.

The neurobiology of stress changes with development. The physiology of stress in childhood suggests a hypo-responsiveness that may buffer young children from physiological damage (Gunnar & Quevedo, 2007). The neurobiological changes may be reversed. Early social stress may be affected by changes in the adverse situation. Social relationships may regulate the physiological reaction and protect the developing brain (Gunnar & Quevedo, 2007).

The onset of puberty is associated with enhanced physiological stress reactivity. The psychosocial and biological changes of adolescence may increase the risk of damage to the rapidly developing brain (Gunnar & Quevedo, 2007). For example, 82 children between 9 and 15 years of age undergoing a laboratory social stress test demonstrated

differences in physiological stress reactivity. The older children demonstrated higher baseline cortisol levels especially related to sexual maturation. There was a blunt cortisol response between ages 11 and 13. At 13 years of age the girls demonstrated a significant cortisol reaction. By 15 years of age both genders demonstrated a significantly higher cortisol response. The children with greater cortisol reactivity reported greater symptoms of anxiety and depression.

Sympathetic ANS activity measured by cardiac measures also increased with age. The children with higher sympathetic tone were more likely to report a fearful temperament (Gunnar, Wewerka, Frenn, Long, & Griggs, 2009). This finding was supported by Stroud et al. (2009). Stress reactivity was compared between 7 to 12 year old children and 13 to 17 year old adolescents to a performance challenge and peer rejection experience. The physiological stress reaction was significantly greater in the adolescents. Levels of cortisol, salivary alpha amylase, blood pressure and heart rate were higher in adolescents than children (Stroud et al., 2009).

The physiological effects of stress are related to age and development (Spear, 2009). Critical periods of growth also affect the rapid development of coping strategies between 8 and 12 years of age (Skinner & Zimmer-Gembeck, 2007).

Volitional Response to Stress-Coping

The management of the stress reaction and efficiency of allostasis is critical to well-being (McEwen & Wingfield, 2007). The effectiveness of coping with stress is more important to well-being than the presence of the stressor (Lazarus, 2006). Effective

coping affects the association between allostasis and health problems (Goldstein & McEwen, 2002). Coping is a learned process linked to education and social rules (Le Moal, 2007). The development of emotions, self-regulation, attention, and control is related to coping (Skinner & Zimmer-Gembeck, 2007). Coping has the potential to integrate the sociocultural factors creating stressors and the physiological processes of stress reactivity (Skinner & Zimmer-Gembeck, 2007).

Coping is part of a process of self-regulation during perceived stress by managing physiology, emotion, attention, behavior, and cognition (Skinner & Zimmer-Gembeck, 2007). The immediate stress reaction is automatic. Regulation impacts the automatic emotional reaction through increased information and flexibility to enhance adaptation (Skinner & Zimmer-Gembeck, 2007). Coping focuses on how these regulatory systems work together throughout a stressful encounter. Coping develops throughout childhood as the regulatory subsystems develop (Skinner & Zimmer-Gembeck, 2007).

Coping in School-Age Children

The classifications of coping strategies in school-age children are numerous. These classifications may be compared with the Lazarus and Folkman conceptualization of problem-focused and emotion-focused coping. Problem-focused coping is an attempt to change the situation such as by problem solving. For example, studying for a test is an action to decrease the stress of not feeling ready for the test by changing the actual situation. The individual prepares for the test by studying. Emotion-focused strategies involve ways to decrease the emotional distress of a situation, such as practicing

relaxation or distraction during a dental appointment. The situation such as dental care may be perceived as less controllable.

Multiple classifications and operationalization of coping hinder meaningful comparisons of findings regarding coping of school-age children. The categories or classifications of coping strategies have been described within two to six factors listed by author in Table 3.

Table 3. *Classification of Coping Strategies in School-Age Children*

Author	Classification	Description
Valiente (2004)	Constructive	Ask for help, problem-solve, think about the problem in a positive way, tell family members about the problem
	Nonconstructive	Physical or verbal aggression
Preus & Dubow (2004)	Seek social support	Tell a friend what happened
	Self reliance/ problem-solving	Think of ways to solve problem.
	Distancing	Forgetting the problem
	Internalizing	Go off by myself
	Externalizing	Yell
Reijntes (2006)	Behavioral engagement	problem-solving or verbal confrontation
	Behavioral-disengagement	Distraction, such as reading
	Behavioral-avoidance	active efforts not to engage in a behavior related to the situation

Author	Classification	Description
	Cognitive engagement	searching for a rational action and positive reappraisal to frame the event into something more positive
	Cognitive disengagement	Mental distraction such as trying to think of a more pleasant event and avoidance to try to forget the event
	Catastrophizing	exaggerating the perceived negative consequences of the event such as worrying
Smith et al.(2006)	Active	Cognitive decision making, direct problem solving, seeking understanding, positive thinking, and optimistic thinking
	Avoidant	Avoidant action, repression, and wishful thinking

Author	Classification	Description
	Support-seeking	Support for action and support for feelings
	Distraction	Physical release of emotions and distracting actions
Bagdi (2006)	Approach	Take charge of a situation
	Avoidance	Turn away from situation
	Active-passive	Direct action or avoid stressor
	Cognitive-emotional	Thinking about what action can be taken or resorting to an emotional expression
	Control	Attempt to restrict damage by retaining control over the situation
	Psychological/social action	Seeking help from social supports or oneself
Marriage & Cummins (2004); Thomsen (2002);	Primary control	Change the stressor
	Secondary control	Control reaction to stressor

Author	Classification	Description
Langer (2005)	Relinquished control	Give up all control
Sorgen & Manine (2002)	Problem-solving	
	Distraction	Emotion-focused, such as watching TV
	Cognitive	Emotion-focused, such as restructuring and trying to see the positive side of the situation
	Seek support	Emotion-focused
	Avoidance	Emotion-focused such as denying the existence of the stressor
	Other	Emotion-focused such as praying, journaling, yelling, sleeping
Langrock (2002); Compas, Connor-Smith, & Jasper (2004)	Primary control	Problem-solving, emotional modulation or expression
	Secondary control	Positive thinking, acceptance,

Author	Classification	Description
		Cognitive restructuring, and distraction
	Disengagement	Denial, avoidance, and wishful thinking
	Involuntary engagement	Rumination, intrusive thought, emotional arousal, physiological arousal, impulsive actions
	Involuntary disengagement	Emotional numbing, inaction cognitive interference
Skybo (2005); Walker, Smith, Garber, & Claar (2006)	Emotion-focused	Change self to adapt to stressor
LaMontagne, Hepworth, Cohen, & Salisbury (2004)	Vigilant	Information-seeking, alert
	Avoidant	Avoid information, denies

The measure of effectiveness of coping strategies is also inconsistent. Many studies identify possible outcomes in relation to internalizing or externalizing symptoms of psychopathology (Compas, Connor-Smith, & Jasper, 2004; Eisenberg, 2001;Langrock, 2002; Reijntjes, 2006; Smith et al., 2006; Sorgen & Manne, 2002). Other studies are interested in the specific coping strategies of a specific population (Walker, Smith, Garber, & Claar, 2006; Preuss & Dubow, 2004; Huang & Menke, 2001).

The coping strategies that can be described as problem-solving, action-oriented, or approaching the stressor to change the situation are generally associated with more adaptive outcomes and are noted more often in children without depressive symptoms. However, rather than associate a specific coping strategy or style with a positive or negative outcome, many strategies are necessary within a single stressful encounter. Multiple coping strategies are also necessary across stressor domains, such as peer, family, or academic experiences. The ability to appraise the stressors and match the strategy that may be most effective is an important consideration in the study of the effectiveness of coping. Problem-focused strategies that change the objective stressor or situation and emotion-focused strategies that modify the person's response to the situation are both needed within an encounter (Lazarus & Folkman, 1984).

Children need to be flexible in the use of various coping strategies. For example, in a study of adolescents between 11 and 18 years of age, the use of particular coping strategies changed over time. The adolescents who used vigilant coping (seeking information, alert to stressful stimuli) in the hospital tended to use avoidant coping

(avoiding information, denying worries, and separating from stressful stimuli) one month after discharge as the stressors changed. This reflects the dynamic process of a stressful experience that is ongoing and presents different demands that require different strategies. Adolescents who used vigilant coping strategies in the hospital may have used avoidant strategies 1 month after surgery to adapt to the unexpected length of recovery and doubts about the decision to undergo the procedure (LaMontagne et al., 2004).

Children as young as 4 years of age have reported the changing appraisals and coping responses throughout an encounter. Caty, Ellerton, & Richie (1997) used a projective technique to examine the appraisal and coping responses to venipuncture of hospitalized 4 to 9-year-old children. Three black and white drawings depicting three phases of a venipuncture (anticipation, drawing of blood, and post venipuncture) were shown to the children. The first drawing is of a woman with blood-drawing equipment, syringe and needle. The second drawing shows the same woman holding the syringe with the needle injected into a child's arm. The third drawing is of the woman emptying the syringe into a blood tube while the child holds a cotton swab on the insertion site. A fourth drawing represents six faces representing a continuum from smiling to crying.

The children pointed to the faces in response to what they thought the child in the picture was feeling. The children identified changing appraisals of threat, harm, and benefit with associated emotions and resultant coping strategies throughout the encounter. For example, two-thirds of the children appraised the anticipatory phase of the

venipuncture a threat. Almost all the children appraised the post-impact phase as a benefit.

The ability to appraise situations and generate coping strategies is related to cognitive development. Interventions need to target adaptation by assisting children to develop long-term coping resources and capacities (Skinner & Zimmer-Gembeck, 2007). While children may tend to use a set array of coping styles, developmental changes and the specifics of the person-environment encounter may lead to different coping responses. The greater flexibility and available coping responses that occur during the school-age years are important developmental assets and resources on which to build.

Mindfulness-Based Stress Reduction

The practice of mindfulness techniques through MBSR influences the process of appraisal and coping. Through changing the perception of the extent to which the stressor taxes or exceeds the individual's resources, there is a modification of the emotional reaction to the experience. This process may improve clarity of mind and enhance a sense of control and cognitive flexibility in generating effective coping strategies (Salmon et al., 2004).

Mindfulness-based stress reduction (MBSR), including meditation and mindful Hatha yoga, trains individuals to recognize when the stress process is beginning and consciously respond, rather than react with the usual unconscious, habitual, cognitive, emotional, and physiological reactions (Kabat-Zinn, 1990/2005). The lack of recognition of these subtle psychological and physiological reactions may lead to chronic activation

and accumulation of physiologic byproducts (Salmon et al., 2004). It is these habitual automatic reactions that may cascade to a detrimental physiological and emotional state of hyperarousal which may enhance maladaptive coping and hinder the ability to generate a repertoire of effective coping strategies (Kabat-Zinn, 1990/2005). Mindfulness builds conscious awareness into these automatic reactions. The development of mindfulness is a skill of particular importance in childhood when foundations of life long health habits are being formed.

Mindfulness meditation, as the basis of MBSR, assumes the integral connection between the mind and the body. Changing the way an individual thinks has an effect on the body and changing the body affects the mind. Mindfulness is conceptualized as a state of moment to moment conscious awareness and nonjudgmental acceptance of the present moment without getting caught up in thoughts or emotions (Bishop, 2002). Mindfulness may be described as a form of "naturalistic observation" in which the individual is simply observing ongoing thoughts without feelings of judgment (Grossman, Niemann, Schmidt, Walach, 2004, p. 36). Thoughts and experiences are approached with awareness, attention, curiosity, and wonder (Kabat-Zinn, 1990/2005). Mindfulness is a natural capacity that may be learned and cultivated (Brown & Ryan, 2004). Mindfulness training fosters the development and quality of mindfulness (Bishop, 2002).

The underlying principles for mindfulness training include: (a) non-judgment, (b) patience, (c) seeing the world as if for the first time, (d) developing trust in oneself, (e) nonstriving for a goal or purpose, (f) acceptance of seeing things as they are without

trying to change anything, (g) and letting go of attachment to repetitive thoughts, actions or beliefs (Kabat-Zinn, 1990/2005). The practice of mindfulness precludes the setting of goals, including relaxation. However, mindfulness meditation is a method of evoking the relaxation response. The relaxation response is the opposite of the physiological reaction to stress. The relaxation response is a parasympathetic response which includes decreased oxygen consumption, decreased heart rate, lower blood pressure, and slower respiratory rate (Deckro et al., 2002).

The underlying assumptions of mindfulness include that: (a) humans are usually not aware of their present experience as it is unfolding, (b) humans are capable of sustained attention, (c) development of mindfulness is gradual and requires practice, (d) practice leads to more accurate perception of one's mental responses, and (e) enhanced emotional processing and coping that results in a greater sense of control (Grossman, 2004). This supports the earlier work of Lazarus and Folkman (1984), who stated that one's beliefs about the ability to control events, is important to the appraisal process.

Clinical-based MBSR is the conscious direction of attention for nonjudgmental awareness that promotes a physiologic hypo-arousal with the intention of improving awareness of the present moment while decreasing habitual reactivity (Salmon et al., 2004). The primary features of MBSR are group interaction, formal and informal meditation practice, daily homework, and a one day silent retreat. The formal practice includes sitting meditation (focusing on the breath, the body, sound, thoughts, body scan (awareness progressing to different parts of the body), and yoga. The informal practices include mindful eating and walking.

The MBSR program developed by Kabat-Zinn (1990/ 2005) includes manualized 2.5 hour weekly classes for 8 weeks. Daily practice of a prescribed 40-45 minutes is expected 6 times each week. Participants are given 2 CD's with instructions and a workbook. A daily log of practice times is kept by participants and returned weekly.

Mechanism of Action

The mechanism of action of MBSR is unclear and in need of further research. The factors suggested as mechanisms of action of mindfulness training include the effect of focused and nonjudgmental awareness on attentional subsystems (Jha, Krompinger, & Baime, 2007), and effects on the anterior cortex (Davidson et al., 2003).

The psycho-educational function of MBSR includes the process of paying attention by monitoring the focus of attention which allows the individual to see thoughts as temporary and unrealistic. The practice of directing the mind to the present moment increases the ability to notice when rumination and intrusive thoughts begin. This increased awareness facilitates the redirection back to the present moment and discourages the ruminative process (Melbourne Academic Mindfulness Interest Group, 2006). The associated decrease in ruminative thoughts has been found to partially mediate the relationship between MBSR and reduced distress scores in 25 year old predominantly white, female students (Jain et al., 2007).

Mindfulness practice reduces the unconscious tendency to attach to unpleasant feelings or emotions. Becoming consciously aware of these attachments may lessen their emotional or behavioral impact (Hamilton, Kizman, & Guyotte, 2006). Mindfulness practice trains individuals to accept thoughts, emotions, and feelings rather than suppress

them or distract oneself from them. Rather, mindfulness encourages the habitual exposure to all emotions, thoughts, and feelings which may decrease the emotional intensity of the experience (Hamilton et al., 2006). Holodynski and Friedlmeier (2006) suggest that coping may be more adaptive with the flexibility of accessing many real emotions rather than encouraging only socially appropriate ones.

The effectiveness of MBSR is based on the ability to focus attention and choose behavior with the intention to think and act in a certain way (Hirst, 2003). Mindfulness training is described as a form of self-regulation or emotional management (Bishop, 2002).

The regulation of emotions influences the extreme reactions of avoidance and over engagement in situations that may affect health outcomes (Hayes & Feldman, 2004). The avoidance of negative or positive experiences (through distraction, denial, cognitive distortion, thought suppression, or substance use) may be adaptive, but harmful when use continues if not effective (Hayes & Feldman, 2004). The over engagement with an experience, such as becoming preoccupied with emotions, may lead to rumination, worry, obsession, or compulsive behavior. Initial engagement with a stressor may be adaptive, but the individual needs to recognize when this strategy is no longer adaptive (Hayes & Feldman, 2004). The exposure to one's thoughts and feelings through mindfulness may actually contribute to distress as automated reactions are lessened (Chödrön, 2001). Symptoms of depression were noted to temporarily worsen after the second phase of mindfulness training (9 to 18 weeks), yet predicted less depression post intervention (Hayes & Feldman, 2004).

Control over attention may increase the skills needed for emotional regulation (Hamilton et al., 2004). Mindfulness training may enhance the ability to reduce attachment to meanings assigned to an event based on past experience. A more realistic appraisal of a new stressor is more likely without the attachment to past meaning.

The research of Williams, Teasdale, Segal, & Soulsby (2000) suggest that distance from emotions is maintained with mindfulness practice. The focused and specific appraisal may attenuate habitual, ineffective ways of coping. Hamilton and Ingram (2001) suggest this improves the ability to generate novel solutions to current problems. Mindfulness training may increase metacognition in relation to emotions which enhances the use of effective regulation strategies (Hamilton et al., 2006). However, Brown and Ryan (2004) suggest that mindfulness is not a metacognitive skill because mindfulness is not part of thoughts or emotions. Rather, mindfulness is a perception of thoughts and emotions. Mindfulness is part of consciousness including awareness and attention to monitor events as they occur and direct the contents of consciousness.

A possible model of mindfulness includes the relationship between mindfulness training and the relationship one has with the experience, influencing alterations in self-regulation, values clarification, cognitive and behavioral flexibility, and exposure (Shapiro, Carlson, Astin, & Freedman, 2006). However, when tested, the mediational effects of reperceiving were not supported (Carmody, Baer, Lykins, & Olendzki, 2009).

The practice of the nonjudgmental attitude of accepting thoughts and feelings as they arise decreases the likelihood that experiences or thoughts get classified. This

practice is suspected to increase cognitive flexibility and acceptance of new experiences. Mindfulness training concentrates on changing the cognitive process rather than the content of the thoughts (Melbourne Academic Mindfulness Interest Group, 2006). Mindfulness training may increase cognitive flexibility by cultivating emotional balance and lessen the habitual patterns of reaction. Habitual patterns of reaction may decrease perception and judgment (Hayes & Feldman, 2004).

Cognitive flexibility, defined by Moore and Malinowski (2009) is the ability to deactivate the automated habitual response. Cognitive flexibility was measured by the ability to maintain and voluntarily direct attention without noting interfering information through the Stroop test and d2 concentration test in 25 mindfulness meditators compared to non-meditators. Mindfulness scores were significantly correlated with Stroop scores and d2 scores demonstrating high levels of mindfulness were related to high processing speed, attention, accuracy.

Mindfulness may be associated with a greater self-acceptance of internal experiences, affective clarity, and ability to regulate emotions, and cognitive flexibility with problem-solving (Hayes & Feldman, 2004). A study of 111 undergraduate students' higher scores in mindfulness was associated with less avoidance, less thought suppression, less rumination, less worrying, and less negative sense of self. Also noted was an increase in cognitive flexibility to affective moods with decreased reports of anxiety and depression (Hayes & Feldman, 2004).The neurocognitive attention subsystems of the brain that influence concentrative and receptive attention may be influenced by mindfulness practice (Jha et al., 2007).

The attentional subsystems include alerting, orienting, and conflict monitoring. Alerting obtains and maintains a state of preparedness. Orienting directs attention to possible information. Conflict monitoring prioritizes tasks. This reflects conceptualizations of the dorsal and ventral attention systems described in neuroscience (Jha et al., 2007). Corbetta and Shulman (2002) propose a system including a bilateral dorsal frontoparietal system concerned with voluntary orienting and a stimulus-driven right-lateralized ventral frontoparietal system. The dorsal system is activated by presentation of cues to which individuals are directed to place attention. The ventral system is an alerting system activated when there is an abrupt change in sensory information. The dorsal system is compared to concentrative attention which has a focus. The ventral system is compared to receptive attention described as ready and unlimited awareness of the present moment (Jha et al., 2007).

The effect of MBSR on the three separate, yet inter-related attentional subsystems were studied in a small sample of adults. The three groups included an 8-week MBSR program, one month intensive mindfulness retreat with experienced mediators, and a control group. The MBSR group demonstrated orienting skills. The retreat group demonstrated improvement in exogenous stimulus detection. The authors concluded that mindfulness training may improve behavior related to attentional functioning (Jha et al., 2007)

Mindfulness training may also affect the neurological functioning of the central nervous system involved in an emotional and stress reaction (Chiesa & Serretti, 2009; Raffone & Srinivasan, 2010). Biological demonstration of the effect of MBSR on the

presumed plasticity of brain development may result in an increased activation of the left anterior cortex which is associated with positive emotion (Davidson et al., 2003). The activation of the left-side of the anterior cortex was noted in individuals who practiced MBSR compared to no meditating controls. In a sample of 25 predominantly white, healthy females, those individuals practicing mindfulness meditation demonstrated a significant increase in the left-sided anterior temporal activity on EEG and EOG (EEG correcting for ocular movements). The increased neural activity was associated with decreased anxiety and negative affect and increased positive affect of participants from a biotechnology company (Davidson et al., 2003).

The magnetic resonance images (MRI) images of the brain of 20 meditators assessed via voxel-baed morphometry demonstrated greater gray mater concentration in the right anterior insula, left inferor temporal gyrus, and right hippocampus compared to a matched non-meditator group. Theses areas of the brain are suspected to be activated during meditation. The right anterior insula is associated with interoceptive awareness. The hippocampus is thought to be related to emotion and attention through the modulation of the amygdala (Holzel et al., 2008)

Kabat-Zinn (2003) and Levine (2000) suggest that mindfulness meditation may affect emotional processing through enhanced anterior brain functioning. The prefrontal cortex uses information to decide emotional and cognitive responses while filtering out unnecessary information. The prefrontal cortex communicates with the whole brain and may inhibit responses to sensory input, thus influencing homeostasis and emotional regulation (Weiss, 2001).

A deficiency in the frontal lobe to inhibit the limbic system is suspected as a cause for the rumination reported in depression and anxiety (Hamilton et al., 2006). The limbic system is a network of neural locations and processes that attempt to maintain a state of homeostasis when experiencing external threats (Weiss, 2007). Strengthening of the function of the anterior cortex may decrease or cease rumination. A study of 23 adults with anxiety and depression reported an inverse relationship between the amount of mindfulness meditation practiced and reports of rumination (Ramel, Goldin, Carmona, & McQuaid, 2004).

Evidence is unclear as to whether MBSR actually enhances a state of mindfulness or is simply a form of relaxation, or simply related to the particular people seeking MBSR (Bishop, 2002). The actual concept of "mindfulness" is difficult to operationalize and is generally not measured when assessing the effectiveness of the MBSR intervention. The outcomes of MBSR are measured by perceived stress, anxiety, pain, mood, or physiological markers. When the concept of mindfulness is operationalized, the state of mindfulness has been reported to mediate the relationship between formal mindfulness practice and an improvement in psychological functioning (Carmody & Baer, 2007).

Mindfulness is grounded in the practice of Vipassana meditation. A recent systematic review of the evidence supporting beneficial effects of Vipassana meditation report a possible association with prefrontal and anterior cingulated cortex activation and increased thickness in cortical areas. However, findings are preliminary due to scant studies of low quality (Chiesa, 2010). Vipassana meditation was related to

neurophysiological findings that support attentional systems. Experienced Vipassana meditators undergoing event-related brain potentials in two mental states were presented with three auditory stimuli via headphones; frequent standard tone, infrequent oddball tone, and infrequent distracter noise. During meditation the amplitude of the distractor was reduced. This may affect attention and the response to distracting stimuli which may be related to decreased emotional reactivity. The amount of daily practice was related to a greater decrease in amplitude (Cahn & Polich, 2009).

Outcomes of MBSR

The Melbourne Academic Mindfulness Interest Group (2006) suggests that MBSR may be effective in treating stress, chronic pain, eating disorders, and affective disorders. The efficacy of MBSR has been evaluated by multiple measures such as symptoms of post-traumatic stress disorder (Kimbrough, Magyari, Langenberg, Chesney, & Berman, 2010), empathy and burnout (Krasner et al., 2009), quality of life, perceived stress and anxiety, decreased negative affect (Grossman, Niemann, Schmidt, & Walach, 2004; Kang, Choi, & Ryu**,** 2009), biological markers such as antibody titers (Davidson et al., 2003),cortisol and dehydroepiandrosterone sulfate (DHEAS) (Carlson, Speca, Patel, & Goodey, 2004).

Many adults found MBSR challenging, but the group support and identification helped develop a deeper understanding of the sensations of anxiety, relaxation, and an awareness of reality in the present moment. Breathing was recognized as an option for responding to experiences. Participants were better able to recognize and stop the cascade

of thoughts in their minds and to deal with feelings as they arose in daily life. The participants identified awareness of the present moment and developed a sensation of an impending decline of mental state (Mason & Hargreaves, 2001).

Controlled studies have been conducted on MBSR, with many including self-referred white females between 18 and 78 years of age. Despite these limitations, moderate effect sizes are reported in a meta-analysis of 20 Studies (Grossman et al., 2004). An approximate effect size of .50 was statistically significant ($p < .0001$) reported with homogeneity of distribution of uncontrolled as well as controlled studies. This suggests that MBSR may be an effective intervention to facilitate the coping process for people with chronic illnesses such as fibromyalgia, cancer, coronary artery disease, pain, obesity and psychopathology such as anxiety, eating disorders, and depression.

Large effect sizes were also reported in predominantly white, female, self-reporting distressed college students. Mindfulness training was compared to relaxation training. The sessions were shorter than the standard MBSR program. These sessions included weekly 1 ½ hour classes for 4 weeks. Both groups reduced distress and improved positive mood states. Despite less exposure to the intervention, the MBSR group demonstrated a larger effect size for positive state of mind (Cohen's $d=.71$, $p< .04$), decreased distraction (Cohen's $d=.25$, $p<.04$), and ruminative thoughts than the relaxation group (Cohen's $s=.57$, $p < .04$) (Jain et al., 2007).

In a review of MBSR empiric literature over the past five years based on the MBSR program developed by Kabat-Zinn (1990), seven studies specifically tested stress

reduction (Carlson & Garland, 2005; Carlson et al., 2004; Carmody & Baer, 2007; Dobkin, 2008; Carlson et al., 2007; Marcus et al., 2003; Robinson et al., 2003) and two studies measured coping (Dobkin, 2008; Tacon et al., 2003). The two self report measures used were the Symptoms of Stress Inventory (SOSI) (Leckie & Thompson, 1979) and the Perceived Stress Scale (PSS) (Cohen & Williamson, 1988). A significant reduction in stress was reported with the SOSI. An effect size of d=.28 ($p < .001$) post intervention was reported in a study of breast and prostate cancer outpatients (Carlson, et al., 2007). The effect size increased at the 6 month (d=.30) and 12 month (d=.40) follow-up periods. In an earlier study, Carlson et al. (2004) measured the change in stress scores (SOSI total score) with and without the participants that attended greater than or less than 5 sessions. Both stress scores were significantly less ($p < .01$). The mean change score was greater in the group of participants that attended more than five sessions compared to the change score in the group that included those who attended less than five sessions. The pre-test and post-test cortisol levels did not significantly change.

The PSS reported a significant change in two of the four studies. Carmody & Baer (2007) reported a significant ($p<.001$) d value of 1.02 and Dobkin (2008) reported a significant ($p=.008$) effect size of 1.17 in a sample of women with breast cancer. Marcus et al. (2003) reported no significant change in PSS scores in a therapeutic community of primarily men (85%). Robinson et al. (2003) reported a small non-significant decrease in cortisol and no significant differences in stress scores with individuals infected with HIV. The perceived stress was high in both the experimental and control groups. The authors

suggested that the termination of the group may have had an effect on the post-test stress scores, reflecting the potential buffering effect of social support.

The coping scores were measured by two different scales. The Coping with Health Injuries Scale (Endler & Parker, 1992) was used with women with breast cancer (Dobkin, 2008) in studying the process of mindfulness. There were no significant changes in the coping scores. The Problem-Focused Style of Coping Questionnaire (Heppner, Cook, Wright, & Johnson, 1995) was used with women with heart disease (Tacon et al., 2003). This measures the degree to which individuals use cognitive, behavioral, and affective coping strategies. The three scales are reflective of thoughtful style, reactive or impulsive, and suppressive or controlled style of coping. The experimental group showed a significant decrease ($p < .03$) in the reactive and impulsive style of coping. The control group showed an increase in this coping style.

Further reviews concur with the significant stress reduction in multiple populations, but continue to site the severe limitations of these studies, including the lack of active control groups (Chiesa & Serretti, 2009) and significant threats to validity (Ospina, 2008). Despite these limitations, reviews site multiple benefits of MBSR such as decreased rumination, trait anxiety, increased empathy and compassion (Chiesa & Serretti, 2009), greater attention, awareness, compassion and acceptance that may support cognitive flexibility and encourage more effective responses to stress (Greeson, 2009).

Mindfulness Training in Children

Anecdotal evidence supports children as young as 9 years of age may develop a formal practice of MBSR resulting in greater awareness and decreased abdominal pain (Ott, 2002). School-age children are able to follow directions, maintain focus and attention, control breathing, and observe thoughts. Children are able to direct mental attention for varying periods of time (Ott, 2002, Rosean & Benn, 2006, Benson, 2006) and notice changes in their body associated with stress (Sharrer & Ryan-Wenger, 2002; Brobeck et al., 2007).

The criteria needed for children to participate in mindfulness training are the ability to follow directions and the willingness to try something new (Ott, 2002). Children have practiced Transcendental Meditation ™ (Rosaen & Benn, 2006), yoga (Galantino et al., 2008), and the Relaxation Response (Benson et al., 2000). For example, middle school students (6 sixth grade girls and 5 eighth grade boys) were able to practice a combined mindfulness training and tai chi program for five weeks in a public school. The children were able to follow the directions and maintain interest in this clinical project (Wall, 2005).

A qualitative study of 10 African-American seventh grade students between 12 and 14 years of age who had been instructed in TM 10 minutes, 2 times a day with their school teacher for one year reported a sense of well-being and improved achievement. The children reported a state of restful alertness, improved self-control, self-reflectivity, and flexibility in emotional responses. The children reported focused attention on

controlling behaviors, increased concentration on current tasks, and improved academic performance. The authors concluded that the ability to meditate offered a protective factor in dealing with the developmental challenges of adolescence (Rosaen & Benn, 2006). Transcendental Meditation is a technique to induce physiological relaxation and stress reduction (Rosaen & Benn, 2006) using mantras, the repetition of a sound or phrase, to achieve an advanced state of consciousness (Alexander, Chandler, Langer, Newman, & Davies, 1989). Mindfulness meditation allows the object of mediation to be what ever enters awareness without a specified goal (Kabat-Zinn, 1990/2005).

Other forms of meditation have successfully been taught to children. The Relaxation Response was taught to approximately 1753 sixth, seventh and eighth grade students by their school teachers. The relaxation response was elicited by focusing on one point attention, such as a word, phrase, prayer, sound image or activity. Children received a relaxation response curriculum once a week for 5 weeks over 3 years. The children who experienced two or more trainings of the relaxation response demonstrated higher grade point averages, work habits scores and cooperation scores than students who had two or less exposures to the relaxation response curriculum. However, the sample included 64% African Americans and the work habits and cooperation were subjectively measured by the teachers. The meditation used in the above studies are different from MBSR, but the ability of children to focus and direct attention is consistent with multiple methods of meditation (Benson et al., 2000).

Mindfulness meditation has been practiced by adolescents (Barnes, Pendergrast, Harshfield, & Treiber, 2008; Beauchemin, Hutchins, & Patterson, 2008; Biegel, Brown, & Shapiro, 2009; Semple, Lee, Rosa, & Miller, 2009; Singh et al., 2007). To investigate the benefit of MBSR for urban, African American adolescents infected with human immunodeficiency virus (HIV), 11 adolescents between 13 and 21 years of age completed at least five sessions of MBSR training closely modeled on the Kabat-Zinn (1990/2005) program. The language of the program was simplified to meet the perceived needs of the participants. Thirty-minute interviews were conducted with each of the participants who completed the sessions. The five completing participants reported: (a) improved attitudes, (b) decreased reactivity, (c) improved behavior by thinking before acting, (d) improved self care, and (e) recognition of the importance of the group (Sibinga, Stewart, T. Welsh, Hutton, & Ellen, 2008).

Adolescents with sleep disturbances or daytime sleepiness after rehabilitation for drug abuse were found to improve sleep quality after attending four out of six sessions of a multicomponent intervention including mindfulness meditation. The participants who dropped out of the program left after week one. The 23 adolescents (62% male) received stimulus control instructions, bright light, sleep hygiene education, cognitive therapy, and MBSR. The length of time and components of the MBSR program are unclear (Bootzin & Stevens, 2005).

The studies with adolescents included participants with a clinical issue such as aggression, learning disabilities, reading problems, or heterogeneous outpatient

psychiatric diagnoses. All interventions were modified from the original MBSR program developed for adults. Modifications included a reduced interventionist to participant ratio, reduced length of homework, shorter sessions, more repetitious practices, shorter meditations. Anxiety was reduced in all studies. However, Semple et al. (2009) noted that anxiety was reduced only in those children (9-13 years old) with reading problems who reported greater anxiety levels at baseline.

Interventions ranged from focusing on the soles of the feet as a way to promote awareness of the present moment (Singh et al., 2007), teacher-lead 5 to 10 minute mindfulness meditations for adolescents with learning disabilities at the beginning of each class daily for five weeks (Beauchemin, Hutchins, & Patterson, 2008), and a modified mindfulness-based cognitive therapy program for 9 to 13 year olds with reading problems meeting 90 minutes a week for 12 weeks (Semple, Lee, Rosa, & Miller, 2009).

Mindful Movement

Mindful movement is based on yoga postures with the conscious awareness and focus on the breath and movements as a method to develop mindfulness. The formal practice of mindful yoga is a movement meditation within the MBSR framework. Yoga, within the adult MBSR literature, increases mindfulness skills, reduces psychological symptomatology and improves well-being. There is a greater significant correlation between the yoga components of MBSR and these variables than any other component of the MBSR program (Carmody & Baer, 2007). The practice of yoga improved scores of general psychopathology despite being practiced on fewer days and for fewer hours than

the other formal practices. The authors suggested that introducing yoga after the other techniques affects the effectiveness of yoga. The earlier formal practices may influence the noted affects of yoga (Carmody & Baer, 2007). However, yoga, as a separate practice, has noted effects on stress reduction.

Yoga, as a distinct practice, is associated with decreased anxiety (Smith, Hancock, Blake-Mortimer, & Eckert, 2007; Waelde, Thompson, & Gallagher-Thompson, 2004; Woolery, Meyers, Sternlieb, & Zeltzer, 2004), stress (Brown & Gerbarg, 2005; Granath, Ingvarsson, von Thiele, & Lundberg, 2006; Michalsen et al., 2005), depression (Butler et al., 2008; Michalsen et al, 2005), pain (daSilva, Lornzi-Filho, & Lage, 2007). Yoga styles differ as well as length of sessions and duration of practice.

The basis of yoga, as a distinct formal practice, focuses on spiritual and ethical development and the Yoga Sutras by Patanjali (Feuerstein, 2003). Yoga includes the coordination between postures (asanas) and breathing (pranayama) to enhance concentration, somatic awareness, mood, and attention. The postures increase flexibility, strength, coordination, and balance (Feuerstein, 2003). However, yoga in the West is grounded in stress reduction, rather than a spiritual practice (DeMichelis, 2004).

Yoga, as a component of MBSR, enhances awareness and attention to body movements and breath. Yoga serves as the basis for mindful movement (Kabat-Zinn, 1990).Yoga promotes physical, mental integration and induces a state of relaxation that may stabilize the autonomic nervous system by enhancing the parasympathetic system and calming the mind. Control of the mind over involuntary muscles is enhanced by the

integration of the body and the mind (Parshad, 2004). Brosnan (1982) and Lalvani (1999) reported enhanced vascular circulation, release of tension, and increased oxygenation that affects the autonomic nervous system. The yoga practice included coordinated movement, stretching, and deep breathing.

Yoga may influence neurotransmitter function. For example, a significant 27% increase in brain y-aminobutyric acid (GABA) levels that may affect mood was found in 8 experienced adult yoga practitioners compared with 11 non-practicing controls. Decreased GABA brain levels are associated with depression and anxiety (Streeter et al., 2007).

The postures and breathing may improve the strength and flexibility of muscles while increasing circulation, uptake of oxygen, and functioning of hormones. The parasympathetic nervous system may become more dominant and stabilize the autonomic nervous system to enhance resistance to the effects of stress (Parshad, 2004). The practice of yoga may help regulate the automatic physiological reaction to stress. It may also train individuals in mindfulness, which serves as a basis for effective stress management, congruent with the concept of involuntary and volitional stress response proposed by Compas (2001) and Skinner and Zimmer-Gembeck (2007).

The development of mindfulness includes observations of feelings, thoughts, and emotions as they arise without trying to change them. This differs from traditional yoga practice of specific yogic breathing techniques and perfecting postures within a spiritual and ethical framework. Rather than focusing on perfecting postures and modifying the breath, mindful movement encourages the nonjudgmental awareness of the body,

feelings, emotions, and thoughts as they arise without necessarily changing them. Mindfulness is associated with yoga in the development of interventions. For example, a program for pregnant women integrated Iyengar yoga and MBSR elements to study psychological and physical distress (Beddoe, Yang, Kennedy, Weiss, & Lee, 2009).

Mindfulness encourages acceptance and nonstriving consistent with yoga philosophy of noncompetition with others. Mindful movement uses the focus of the postures and breath, feelings, and emotions as a method to increase mindfulness. The development of improving postures at one's own pace and recognizing limits of activity enhances letting go of expectations of having to succeed in postures. Activities for school-age children need to be fun and promote continuation into adulthood (Nowicka, 2006).

Yoga may be practiced with increasing age and changing physical conditions. Mindful movement based on yoga is consistent with developmentally appropriate childhood programs. Programs for school-age children need to provide opportunities to learn with the respect, support, and control over the rate of learning without competition with peers (Eccles, 1999).

Yoga as mindful movement for Children

Yoga, as a distinct practice may enhance relaxation (Smith et al., 2007), and improve hypertension, anxiety, and coronary artery disease (Gupta, Khera, Vempati, Sharma, & Bijlani, 2002) for adults. The study of yoga within MBSR emphasizes the psycho-educational and physiological components of present-moment awareness of mindfulness. Adolescents report the willingness to use yoga as a therapy for pain when

asked about complementary and alternative therapies (Tsao, Meldrum, Kim, Jacob, & Zeltzer, 2007).

The effects of yoga in children are anecdotal and include calming mood, improving concentration and academic performance (Flisek, 2001), and reducing headaches, constipation, and stomach aches (Luby, 1998). However, a paucity of empiric evidence exists to support these findings in children.

The effects of yoga remain unsupported due to small sample sizes, inconsistent intervention description, varying outcome measures, and low power. A review of 24 articles of yoga for children reported a large variety of outcomes and measures, lack of adverse reporting, small sample sizes, and low power (Galantino, Galbavy, & Quinn, 2008). The paucity of high quality studies of yoga in children limits the usefulness and generalizability of the findings. However, evidence suggests that yoga is associated with improved cardiovascular status, physical functioning, and behavior (Galantino et al., 2007). A subsequent review concurred that the poor quality of studies limits recommendations, but that yoga for children appears to have no adverse events and may have a role in psychological and physical health (Birdee et al., 2009).

Yoga includes various techniques and styles. Reviewing studies of yoga for children based on postures (asanas) rather than exclusive breathing techniques (pranayama) yielded studies of poor quality. Studies of yoga in children address chronic health concerns such as attention deficit hyperactivity disorder (ADHD) (Jensen & Kenny, 2004), irritable bowel syndrome (IBS) (Kuttner et al., 2006), and asthma (Jain et al., 1991; Khanam, Sachdeva, Guleria, & Deepak, 1996). Other studies investigate the

effects of yoga with healthy children in relation to learning and attention (Manjunath & Telles, 2001, 2004), physiologic affects (Mandanmohan & Bhavanani, 2003) and relaxation (Stueck & Gloeckner, 2005).

While all studies included postures (asanas) and breathing techniques (pranayama), many other studies used additional techniques such as massage and drawing (Strueck & Gloeckner, 2005), guided imagery (Strueck & Gloeckner), yoga cleansing practices (Manjunath & Telles, 2001; Jain et al., 1991), concentration techniques (Jensen & Kenny, 2004), and devotional songs (Manjunath & Telles, 2001).

The length of studies ranged from ten days to evaluate spatial memory in adolescents (Manjunath & Telles, 2004) to 6 months to evaluate the effects of yoga on handgrip and pulmonary function (Mandanmohan & Bhavanani, 2003). The sessions were of variable lengths related to the site of study. Studies within an institution such as residential, hospital, or camp site reported longer duration of sessions. Sessions lasting one hour and fifteen minutes a day for four weeks were reported in a residential home (Manjunath & Telles, 2001) and sessions lasting 90 minutes in the morning and one hour at night for 40 days were reported in a hospital setting for adolescents with asthma (Jain et al., 1991). Manjunath & Telles (2004) studied spatial and verbal memory of adolescents in a camp practicing yoga eight hours a day for ten days. Jensen and Kenny (2004) studied boys participating in 20 sessions of yoga, meeting one hour a week. The sample sizes in all studies were small without a description of attrition. The sample sizes ranged from 19 children and adolescents (Jensen & Kenny, 2004) to 60 early and middle adolescents (Manjunath & Telles (2004).

Outcomes studied included psychological effects such as a decrease in feelings of helplessness (Strueck & Gloeckner, 2005), improved pulmonary function (Jain et al., 1991; Mandanmohan & Bhavanani, 2003), decreased symptoms of disease (Jain et al., Kuttner et al., 2006, Mandanmohan & Bhavanani), and improved cognitive function (Manjunath & Telles, 2001, 2004). All studies lacked a clear description of yoga asanas, specific pranayama practice, imagery, or mechanism of action.

Yoga may affect the functioning of the pre-frontal cortex. The functions of the pre-frontal cortex include the ability to plan and execute complex functions. After one month of 75 minutes of daily yoga, breathing, internal cleansing practices, meditation, devotional songs, and relaxation reduced the time required execute a mental test by 10 to 13-year-old girls (Manjunath & Telles, 2001). The authors suggest that yoga improved alertness which resulted in the rapid realization of errors and correction by improving the function of the frontal lobe through increased blood flow.

Yoga may improve attention and emotional control. Jensen and Kenny (2004) studied 11 boys with ADHD compared with a control group of 8 boys. Despite low power, varied attendance, and lack of determination of quality and duration of home practice, there was a reported reduction of mood swings, temper outbursts, and crying fits on the Conners Global Emotional Lability Index. This is consistent with a paper by Nardo and Reynolds' (2002) presented at the annual meeting of the National Association of School Psychologists described by Peck et al. (2005) which reported that yoga promotes self-control, attention, concentration, self efficacy, body awareness, and stress reduction.

Empiric support for the physiological actions or contraindications of yoga asanas is lacking. During menses, adolescents may continue to practice yoga. However, while empiric support is lacking, shoulder stands and inverted postures that raise the legs above the heart and lift the torso are discouraged from practice during menses (Iyengar, 2001/2008).

Summary

The experience of stress is a product of the exposure of an individual to a situation that is cognitively appraised as a harm or threat. School-age children are able to recognize stressors and feelings associated with stress. The response to stress includes involuntary physiological and emotional arousal, as well as volitional coping strategies. Individuals develop habitual and automatic reactions to stress which may be adaptive in the short term. However, the cascade of physiological mediators with emotional arousal may lead to chronic deleterious physiological effects. Effective management of stress includes the ability to enhance adaptation and minimize over activity and prolonged exposure to physiological mediators that effect physical and mental health. School-age children report multiple stressors, coping strategies, and the ability to appraise controllability of stressors. Individual differences such as self-esteem may influence the appraisal process and affect adaptation and outcomes of stress management.

The practice of MBSR trains individuals to increase present-moment awareness of body, feelings, emotions, and thoughts and may increase the ability to recognize the stress reaction when it begins and to consciously respond. The early responses to stress may short circuit the automatic physiological cascade and shorten the duration of a stress

reaction. The ability to recognize the reaction to stress when it begins is important for generating effective coping responses. The recognition of symptoms of stress is a "necessary prerequisite" for coping (Salmon et al., 2004 p. 436). Earlier recognition of an emotion may assist children in responding before the ensuing physiological reaction to stress. Yoga and MBSR are associated with decreasing stress, anxiety, and depression in adults and may influence self-esteem.

Girls tend to appraise stress differently than boys and react with more maladaptive emotional strategies, such as rumination, which may place girls at a greater risk for the development of depression (Papadakis, 2006). MBSR may be particularly helpful for girls due to the decrease in rumination reported with MBSR practice (Jain et al., 2007). Girls are at increased risk for low self-esteem and learned helplessness which may affect cognitive appraisal and coping resources.

Many different coping strategies used synergistically within a stressful encounter may be most effective for the short and long-term management of stress. The ability to change coping strategies in response to changing appraisals throughout an encounter is necessary to manage stress. Therefore, it is not enough to have a repertoire of coping strategies, but to experience the clarity of thought to appraise the situation accurately and access available resources. The regulation of emotions is one of the functions of coping. Enhancing emotional regulation, self-esteem, coping strategies, cognitive flexibility, and clarity of thought build inner resources to be drawn upon during the appraisal of potential stressors.

Mindful movement provides a developmental approach to mindfulness training. Yoga is associated with improved attention and emotional control in children (Jensen & Kenny, 2004). Mindful movement, as a physical activity, may enhance self-esteem and build a life long pattern of physical activity to maintain health. School-age children are interested in yoga as a mind-body therapy (Tsao et al., 2007).

School-age children are at a period immediately before the critical developmental period of adolescence. The rapid neural development of adolescence increases the risk of deleterious effects of stress on the developing brain. The school-age period is a time of malleability of self-esteem. The development of stress management skills prior to adolescence may build protective factors to buffer children from the inevitable psychological and physical turbulence of adolescence.

School-age children are capable of intentionality, ability to voluntary sustain and shift attention, meta-cognition, and self regulatory abilities that are the foundation of MBSR and a variety of coping responses. Mindfulness training may protect children from the damaging effects of stress and lay the foundation for the life-long development of resilience. Therefore, a developmental approach to mindfulness training through mindful movement needs to be explored and tested.

CHAPTER THREE

Study Methodology

Study Aims

The purpose of this study was to the test the efficacy and feasibility of an eight week stress reduction program using mindful movement as a strategy to decrease levels of perceived stress, facilitate coping, and enhance self-esteem and self-regulation in school-age girls. The intervention of mindful movement based on yoga included 8 weekly 60 minute sessions immediately after school and 10 minutes of daily yoga homework.

Research Questions

The following research questions were addressed:

1. To what extent do school-age girls who participate in an eight week mindful movement intervention report significantly different levels of perceived stress, effectiveness and number of coping strategies, levels of self-esteem, and self-regulation than girls in a wait-list control group?
2. To what extent is the dose of mindful movement inversely correlated with perceived stress and positively correlated with effectiveness and number of coping strategies, self-esteem, and self-regulation in school-age girls?

Hypotheses

The following hypotheses were tested:

1. School-age girls who participate in mindful movement stress reduction will report significantly less perceived stress, significantly greater effectiveness and number of coping strategies, significantly greater self-esteem, and self-regulation than school-age girls who participate in a wait-list control group.
2. The dose of mindful movement is inversely correlated with perceived stress and positively correlated with effectiveness and number of coping strategies, self-esteem, and self-regulation.

Design

A randomized cluster, repeated measures research design was used within two public schools. The primary outcome variables of the study included perceived stress and effectiveness and number of coping strategies, self-esteem, and self-regulation measured at two time points. These five outcome variables were measured at week one of the intervention and post-intervention at week eight**.** Randomization by group rather than participants was utilized to minimize the possible diffusion of the intervention from communication between children within the same school (Grady, Cummings, & Hulley, 1988/2007). The control group was used to control threats caused by history and maturation (Lindquist, Wyman, Talley, Findorff, & Gross, 2007).

The use of a wait-list control group was selected to lessen possible demoralization of the participants' perception of receiving a less desirable treatment (Cummings, Grady, & Hulley, 1988/2007; Lindquist et al.). The wait list control requires that the intervention

be assessed within a few months of implementation (Cummings et al). MBSR has demonstrated effects within 8 weeks in adults (Grossman, et al., 2004). The use of a wait list control group also avoids the unexpected benefits of an active control (Lindquist et al.), especially in the absence of a well-supported standard treatment (Lavori, 2000). The randomization of the schools lessens the possible interactions with selection in relation to instrumentation, maturation and history (Cummings et al.; Grady et al.).

Modifications Based on Pilot Study

A focus group of seven 10 year old girls from a public school was conducted to evaluate the feasibility of the proposed intervention and instruments. The participants identified and discussed the experience of daily stressors and associated symptoms. The focus group participants identified the clarity, feasibility, and time commitment of the instruments and recommended alterations in the proposed measures and in intervention components. The length and clarity of the proposed Children's Stressor Scale and the response choices for the Schoolagers' Coping Strategies Inventory II were reported confusing and too lengthy by fifth grade girls. Therefore, the Feel Bad Scale (FBS) and the Schoolagers' Coping Strategies Inventory (SCSI) were chosen for use in this study.

The homework records were changed from time of practice to a check mark of whether the practice was completed. The homework was reduced from 15 minutes to 10 minutes with the production of a compact disc with homework directions. The assignment of recording stressful and pleasant experiences was deleted.

Intervention Fidelity

The treatment implementation included monitoring the induction and assessment of the delivery, receipt, and enactment of the intervention (Burgio et al., 2001; Spillane, Byrne, Leathem, O'Malley, & Cupples, 2007). The induction refers to actions that enhance the probability that the treatment implementation will occur as planned. The assessment includes quantitative and qualitative measures that the treatment implementation has occurred (Lichstein, Riedel, & Grieve, 1994). The delivery of the intervention includes the ability of the interventionist to present the intervention as intended. The receipt of the intervention is the degree to which the participant actually received the treatment as intended. The enactment of the intervention is the degree to which the participant actually demonstrates the intended changes (Lichstein et. al). Table 4 describes methods of ensuring intervention fidelity.

Treatment Delivery

The interventionist should have adequate training to implement the intervention (Conn, Rantz, Wipke-Tevis, & Maas, 2001). The induction of the treatment delivery included training of the interventionist in mindfulness meditation and pediatric yoga. Focus groups are recommended to plan and monitor the intervention (Spillane et al., 2007). Pilot testing of the scale items and clarification of the essential elements of the experimental group is suggested (Stein, Sargent, & Rafaels, 2007). A focus group of a representative sample was conducted to test the intervention and measures.

The assessment of treatment delivery was measured by the use of an intervention manual outlining each session with a checklist (Santacroce, Maccarelli, & Grey, 2004),

and a journal (field notes) kept by the interventionist after each session (Spillane et al., 2007). The checklists reflected the topics from the manual. The manual included goals, outline of sessions, script, handouts, and key ideas (Santacroce et al). The manual outlined the essential elements of the intervention needed to maintain fidelity through adherence to the intervention as outlined (Stein et al, 2007) while balancing the flexibility needed by the participants (Santacroce et al.). The journal was used to record impressions of each session including interactions, reactions, temperature, and environmental factors. An intervention checklist was kept by the research assistants during and after ach session.

Treatment Receipt

The induction of the receipt of the intervention included written instructions, pictures of the mindful movements, compact disk with audio instructions, detailed explanation of the homework, and feedback during the sessions. Written instructions, feedback, and ensuring the participants have the homework, and encouraging questions assists in the routine quality assurance checks of the receipt of the intervention (Burgio et al., 2001). Villarruel, Jemmott, Jemmott, & Eakin (2006) report the necessity of phone and postal reminders for research participants. The parents of the children were contacted by phone one or two days before the start of the session. The parents were to call the investigator or school nurse if a child would not be at the session.

The assessment of the receipt of the intervention included checking that the participants had their homework and handouts at the end of each session, observing the performance of mindful movement, recording attendance, and weekly qualitative

discussion of the past week's assignment. The observations allowed demonstration of the attained skills of the participants (Burgio et al., 2001). The discussion qualitatively assessed how well the skills were understood by the participants (Morse, Penrod, & Hupcy, 2000; Spillane et al., 2007).

Treatment Enactment

The induction of the enactment of the intervention included reminders, written instructions, feedback during sessions (Burgio et al., 2001) and observation of participants performing mindful movement during sessions in order to monitor the acquisition of the taught skills (Spillane et al., 2007). Self-report of assigned treatment activities enhances the enactment of the intervention (Burgio; Spillane). Weekly self-report checklists of daily yoga practice were collected every week. Progress over time may be evaluated through qualitative data (Morse et al., 2000). Data from discussions and focus groups may also assess understanding and the use of the intervention skills in daily life (Burgio; Spillane). Participants may be questioned about the use of the intervention techniques (Burgio). Weekly discussions and a course evaluation were used to explore the experience of participation. The checklists were monitored by research assistants who checked the consistency between sessions, manual, and checklists.

Proposed Sampling Methods

The sample for this study consisted of fourth and fifth grade girls attending Massachusetts public schools. Fourth and Fifth grade girls were the population of interest due to the cognitive, emotional, and social development of this age, including self-awareness, greater coping strategies, malleability of self-esteem, and developing control

beliefs. Girls in the fourth and fifth grade have been in the respective school for one or two years. Learning new skills may be facilitated during a period of familiarity rather than a time of upheaval such as the middle school transition or adolescent changes. Girls at this age are at risk for the impending developmental challenges of adolescence (Hampel & Peterman, 2006). Adolescent girls report greater stress, less adaptive coping, less self-esteem, and more rumination and depression than boys (Hampel & Peterman, 2006; Washburn-Ormachea et al., 2004).

The proposed sample criteria were designed to meet the desired clinical demographic characteristics. The inclusion criteria reflected the main characteristics of the target population. The exclusion criteria were few and reflect a subset of girls that were suspected to demonstrate a high likelihood of attrition, inability to provide the needed information, and may have had a greater risk of adverse events (Hulley, Newman, & Cummings, 2007).

Inclusion criteria consisted of fourth and fifth grade girls who attend Massachusetts public schools who were: 1) willing to participate in a weekly class for the length of the intervention; 2) willing to complete daily homework six days each week; 3) able to speak, read, and write the English language; 4) pay attention for one hour; and 5) able to participate in physical poses. Students with a history of formal mindfulness or yoga training or a developmental disorder as determined by the need for special education one to one assistance were excluded from the study. All respondants met the inclusion criteria. No one needed to be excluded. The setting of two public schools was chosen based on similar demographic variables described in Table 5.

Table 4. *Intervention Fidelity*

Phases of Implementation	Induction	Assessment
Treatment Delivery	Interventionist training Focus group pre-testing	Intervention Manual Interventionist journal Intervention checklist
Treatment Receipt	Written, pictorial, audio instructions Detailed explanation of homework Rewards for returning homework[a] Parental reminders	Check handouts received Observation of postures Attendance record Weekly qualitative discussion about the week's practice
Treatment Enactment	Feedback given to children during sessions Observation of children's postures Written, pictorial, audio instructions	Weekly self-report check of daily practice Qualitative data from weekly discussions Evaluation at week eight Effect of dose on the outcomes statistically tested.

Note. [a] The children received little gifts for the receipt of the homework. If forgotten, they could return the form the following day to the school nurse.

Table 5. Demographic Variables of the Two School Settings

Variables	School Intervention	School Control
Total Town Population[a]	15,796	13,801
Median Household Income[a]	$84,457	$95,912
Total School Population[b]	2671	2951
Study School Population[b]	647	612
School Racial Distribution(%)[b]		
African American	2.9	1.1
Asian	4.8	2.3
Hispanic	5.7	1.6
Native American	.3	0
White	83.4	94.4
Pacific Islander	.5	0
Multiracial(non Hispanic)	2.4	.6

[a] City-data. (2009). [Town Profiles]. Unpublished data. Retrieved January 5, 2009, from http:// www.city-data.com

City-data. (2009). [Town Profiles]. Unpublished data. Retrieved January 5, 2009, from http:// www.city-data.com

[b] Department of Education. (2008). *Massachusetts school and district profiles* (Enrollment data).

Boston: Department of Education. Retrieved January 5, 2009, from Department of Education Web site: http://profiles.doe.mass.edu

Sample Size

An a priori power analysis was used to determine an adequate sample size to ensure protection from Type I and Type II statistical errors for the proposed research purpose (Cohen, 1992). The power, alpha significance level, and estimated smallest effect size that is clinically significant was used to calculate the sample size (Devane, Begley, & Clarke, 2004). A power of .80 is recommended to detect a reasonable effect size (Browner, Newman, & Hulley, 1988/2007; Cohen, 1992; Devane et al., 2004).

The medium effect size was used as an estimate. A medium effect size is visible to careful observation with the naked eye (Cohen, 1992). No effect sizes were reported for MBSR programs for children. However, a meta-analysis of 20 MBSR studies of adults with multiple clinical outcomes reported medium effect sizes (Cohen's d=.50, $p<.0001$) (Grossman et al., 2004).

Studies of stress and MBSR programs in adults reported effect sizes that ranged from no significant effect with men in a therapeutic community (Marcus et al., 2003) to a very large effect size (Cohen's d=1.17, $p<.008$) in women with breast cancer (Dobkin, 2008).Each test has it's own effect size index (Cohen, 1992). The medium effect size for analysis of variance is the *f* statistic ($f=.25$) (Cohen).

An a priori power analysis, given two time points, with a power of .80, alpha level of .05, and effect size of $f=.25$ calculated a total sample size of 128 participants. (Faul, 1992/2008). A 10% attrition rate was assumed. Therefore, the proposed sample size for this study was 140, with 70 participants per group. Rates of attrition from MBSR programs are variable, and not consistently reported in many MBSR studies. However, in

a review of 24 empirical reports about MBSR in empirical, English language peer-reviewed journals within the past five years, specifically clinical trials, meta-analyses identified attrition rates ranging from 10% in a study of 60.5 year old women with heart disease (Tacon et al., 2003) to 84% in a study of 39 year old low-income Spanish and English-speaking women with abnormal pap smears (Abercrombie et al., 2007). The explanation for this high attrition rate was suspected by the authors to be related to the hectic and unpredictable lives of this population. Despite reminder phone calls about the meetings, many women needed to attend substance abuse groups and court and housing appointments. The meeting time was considered inconvenient and the program was described by the authors as unconventional. The remaining studies reported attrition rates ranging from 15 to 43 %.

Studies in children with low attrition rates and high adherence rates report common factors that enhance retention. In a study exploring the reasons for retention in a longitudinal ophthalmology program, over 90% of the participants reported that staff characteristics of friendliness, responsiveness, consistency and commitment of the participants to the study were the most important factors in retention. Sixty-four percent reported that gratitude from the staff was a major factor. Tangible items as incentives were rated least important (Dias, 2005). Other factors include reminders of meeting times (Dias, 2005; Frank, Nader, Zive, Broyles, & Brennan, 2003; Villarruel et al., 2006), feedback given to participants (Strunk et al., 2002), follow-up of missed assignments (Robbins, Gretebeck, Kazanis, & Pender, 2006), consistent personnel (Dias; Robbins et al.; Villarruel et al.), clear expectations of responsibilities with a written commitment or

signed assent with an emphasis on the importance of participation (Dias; Frank et al.), and small gifts or cash (Dias; Frank et al.; Strunk et al.). Many studies designed logos of the treatment program (Dias; Frank et al.; Villarruel et al.).

Consistent with the above recommendations, multiple incentives and strategies were provided to enhance retention in this study. A focus group with children and in consultation with school officials reported a convenient time and location for the study would be immediately after school in a designated warm classroom. The children were asked to sign an assent after an explanation of the study and encouragement to ask questions. The PI had consistent contact with the participants with feedback and weekly assessments of participant experience with the intervention, phone reminders, immediate follow-up of missed sessions and homework papers, and multiple small gifts. The wait list control group received a gift certificate to a local general store, gratitude, consistent contact with one researcher, and the offer of the intervention. The program name, MAGY (Mindful Awareness for Girls through Yoga) was created to maintain confidentiality for study participants staying after school for the program. Recruitment began the second week of the school year, September, 2009 after the approval of the school principals and the Institutional Review Board of Boston College

Fourth and Fifth grade girls from two demographically comparable Massachusetts public elementary schools were recruited by an invitational letter sent to guardians of fourth and fifth grade girls. The letter included an introduction of the principal investigator, purpose of the study, and a description of the procedures involved with

participation. The letter also included instructions and an invitation to sign the enclosed consent and assent forms.

Procedures

The schools were randomly assigned to the intervention or wait-list control. The participants were from two demographically similar Massachusetts public schools. The schools were compared using publicly-accessible demographic data. Public schools were chosen to best represent the demographics of the communities in which the schools were located described in Table 5. The schools were chosen after interviews with the principals to assess similarities regarding school philosophy and interest in the program and research. The success of studies partnering with community agencies is related to the congruence between the research agency, research topic, and outside agency. The similarity of the philosophy of the schools is important to the implementation of an intervention (Butterfield, Yates, Rogers, & Healow, 2003).

A recruitment letter was sent to all fourth and fifth grade guardians with the consent and assent, and demographic form. The signed consents were returned to a designated box sealed with duct tape in the school nursing office (Appendix A). The guardians were reminded of the first meeting by phone (Grady et al., 1988/2007; Robbins et al., 2006; Villarreul, 2006). At the first meeting the assent was obtained, followed by the paper and pencil questionnaires. The assent was to help the children feel a sense of responsibility or control (Frank et al., 2003) and may have acted as a formal commitment to the project (Dias, 2005). Those girls meeting exclusion criteria would have received the intervention without data analysis as per school principals.

The experimental group and the control group were asked to complete a demographic form at baseline. The instruments (Appendix B), including: the Feel Bad Scale (FBS), the Schoolagers' Coping Strategies Inventory I (SCSI), the Global Self-Worth scale of the Self Perception Profile for Children (SPPC), and the Healthy Self-Regulation subscale of the Mindful Thinking and Action Scale for Adolescents (MTASA) were administered by paper and pencil while the items were read aloud by the interventionist. If a student could not come on the designated day, she was allowed to attend a different group day. The measures were administered at the first week and at week 8 (Table 6). The estimated time of completion was 20 minutes as determined by pre-testing with fifth grade girls from one of the target schools. However, the instruments took approximately 45 minutes for the whole group to complete.

Table 6. *Data Collection Schedule*

Time 1 (baseline, week 1)	Time 2 (week 8)
Demographic form (by guardians)	
FBS[a]	FBS
SCSI[b]	SCSI
SPPC[c]	SPPC
MTASA[d]	MTASA

Note. [a]Feel Bad Scale, [b]Schoolagers' Coping Strategies Inventory , [c]Self Perception Profile for Children Global Self Worth subscale, [d] Mindful Thinking and Action Scale for Adolescents Healthy Self-Regulation Subscale.

The experimental group met approximately 60 minutes after school one day per week for 8 weeks and completed 10 minutes of homework 6 days a week with oral and pictorial references. The control group met at week 0 and week 9**.** The control group participants were offered the intervention at the completion of the experimental group to enhance interest and participation in the study despite randomization to the control and enhance internal validity (Grady et al., 1988/2007; Lindquist et al., 2007). The researcher conducted all intervention sessions. The first week the investigator met with both groups of participants to explain the study and the measures. The experimental group received instruction in mindful movement based on yoga poses (Appendix C).

The experimental group met weekly on the same day at the same time period in a room designated by the school principal immediately after school to facilitate consistency and comfort for the participants (Villarruel et al., 2006). The investigator delivered the intervention at each session with an emphasis on an atmosphere of nonjudgment and support to enhance participant retention (Dias, 2005). There were a total of seven research assistants. Three to four assistants attended each session to assist any girl who needed help or needed to leave the room. The intervention was delivered according to a manualized guide to the intervention as well as guidelines for discussion (Burgio et al., 2001; Spillane et al., 2007). The scheduled data collection points were consistent with studies of MBSR in adults and are described in Table 6.

The start of each session for the intervention group began with a group discussion concerning the experiences with that week's homework. The discussion was audio-taped for content and interventionist fidelity (Morse et al., 2000). The homework consisted of

ten minutes of yoga guided by a compact disk (CD) and visual aid of the yoga poses. If there were contraindications to poses, alternate poses were given and the girls were reminded repetitively that the nature of the movements was not to strain oneself or to cause pain. The completion of the homework was reported by the participants through a checklist record. Multiple incentives were offered for adherence with homework assignments (Dias, 2005; Frank et al., 2003; Strunk et al., 2002;Villarruel et al., 2006). The participants received a little gift when the forms were returned, such as bracelets, bubbles, bookmarks, pencils, balls. The return of homework was monitored weekly. Those participants forgetting the homework were invited to return the form in to the nurse's office the next day. No one returned the forms to the nurse.

Protection of Human Subjects

Permission for this study was obtained from the respective principals then approval for consent and assurance of confidentiality was obtained according to the parameter outlined by the by the Boston college Institutional Review Board as well as the Protection of Pupil Rights Amendment, and the Studies Including Minors requirements (Appendix D). The school nurses in both schools completed the research with human subjects training program. The community service volunteer assistants completed the National Institutes of Health web-based training course Protecting Human Research Participants and were trained in confidentiality and how to assist with collecting questionnaires and monitoring the group sessions for participants who may be upset or need help.

The recruitment letter included the assent, explanation and contact information for Boston College Institutional Review Board, and contact information of the PI, as well as instructions for the enclosed consent form, which includes the request to indicate with a yes or no box whether or not the child will be participating in the study.

The signed consents and demographic form were returned to the school health office and put into a sealed box with a slot to be supervised by the school nurse, who completed the Human Participants Protection Education for Research Teams certification. The request to return the consent after checking a participation box regardless of intention to participate was to increase confidentiality of the children returning forms. The involvement of the school nurse was based on the preference of the school and nurses to reflect the realities of the school nurse role and school responsibilities (Butterfield et al., 2003).

As an incentive to become part of the investigation, participants received a yoga mat and small gifts. The control group received a gift card and was offered the intervention protocol after the eighth week study period. The assent was obtained from the girls at the first meeting and the girls were reminded throughout the intervention of the voluntary nature of the study.

Definitions and Instruments

Five outcomes variables were measured by four paper and pencil questionnaires obtained at two time points. The instruments were administered at baseline and after the intervention at week 8. The demographic form was completed at time one by the child's guardian.

Demographic and clinical characteristics. were measured by a questionnaire for guardians. The information included parental marital status, education, employment, family religion, presence of chronic illness, history of meditation or yoga practice, family stressor and participant age and grade.

Stress. is the constantly changing result of one's appraisal of an interaction as a harm, threat, or challenge that is perceived to exceed a person's available resources as measured by the score on the Fell Bad Scale.

The Feel Bad Scale (FBS). The Feel Bad Scale (Lewis, Siegel, Lewis, 1984) is a 20 item scale with three columns that measures how stressed children feel. The first column lists stressors. The second column lists how "bad" children would feel if that stressor occurred. The third column asks the frequency of occurrence of the stressor. The badness is measured on a 5-point Likert scale with 1=not bad, 2=a little bad, 3=pretty bad, 4=real bad, and 5=terrible. The third column (frequency) is also measured on a 5-point Likert scale. The rating includes 1=never, 2= 1or 2 times, 3=sometimes, 4=often, and 5=all the time. A feel bad score is calculated by multiplying the badness (column 2) and the frequency (column 3) rating for each item and summing the products. The score ranges form 20 to 500. The higher score reflects greater perceived distress.

The items were generated by asking 50-60 fifth and sixth grade children what happens that makes them feel bad, nervous, or worried. The resulting items were tested with 2,400 fifth grade children as part of a decision-making curriculum. The sample was 43% white, 19% black, and 38% Native American, Latino, or Asian. The internal consistency Cronbach's Coefficient Alpha was .82. There was no test-retest coefficient

measured. Concurrent validity was reported as a correlation between the FBS and self-reported mental health ratings. The FBS has been used with school- age children with reported Cronbach's coefficient alphas between .81-.85 (Jenkins, Rew, & Sternglanz, 2005; Rew, 2004; Taxis, Rew, Jackson, & Kouzekanani, 2004).

Ryan-Wenger et al. (2005) used an open-ended question at the end of the FBS. In a study of coping strategies, the question: "What is the worst thing that has happened to you lately?" allowed for individual stressor experiences to be recorded (Ryan-Wenger et al., p. 285). This open-ended question was added to the current FBS. The reported stressors will be counted and categorized for use with future scale development. Ryan-Wenger et al. reported that stressors have changed considerably over the past thirty years and scales may not include stressors experienced by contemporary children. Pre-testing of the FBS with fifth grade girls demonstrated ease of administration, clarity of items and a completion time of five minutes.

Coping strategies. are actual conscious and purposeful efforts by the individual to manage stress (Lazarus & Folkman, 1984). Coping includes conscious, volition efforts to regulate emotion, cognition, behavior, physiology, and the environment in responses to stressful circumstances (Compas, 2001). The number and effectiveness of coping strategies were measured by the Schoolagers' Coping Strategies Inventory.

The Schoolagers' Coping Strategies Inventory (SCSI). The SCSI is based on the adult transactional model of Lazarus and Folkman (1984). The scale is a 26 item self-report questionnaire designed for children between 8 to 12 years of age. There are three columns: strategy; frequency of use; and effectiveness of the strategies. The instrument is

a four point Likert scale and takes 10 minutes to complete. Separate scores are obtained for both the frequency and effectiveness scales. A total score representing the construct of stress coping strategies is the sum of the two scales. Higher scores reflect more effective coping (Ryan-Wenger, 1990). The effectiveness subscale was to be used with the number of strategies reported. The effectiveness subscale needs to be interpreted with caution due to an error in response choices and inconsistent participant responses. The number of strategies was not counted due to missing data and the inability to infer the number of strategies. The coping strategies reported were described. The frequency subscale was used to measure how frequently coping strategies were used during a stressful encounter.

The frequency column measures how often the children use a particular coping strategy "before the stressful thing happens, while you feel stressed, and after the stressful thing is over". The frequency score is the sum of all item responses on a 4-point Likert scale with 0=never, 1= once in a while, 2=a lot, and 3=most of the time. The scores can range from 0-78.

The effectiveness part of the scale reports how helpful coping strategies are perceived to be by the children by asking "how much does it help?" Items are measured on a four-point Likert scale with 0=never do it, 1=does not help, 2= helps a little, and 3=helps a lot. The effectiveness score ranges from 0-78. Higher scores reflect a greater effectiveness of coping strategies. The number of different strategies used may be calculated by subtracting the number of items with a never response from the total number of items (coping strategies) reported. The scores range from 0-26 (Huth, 1999).

The SCSI was developed from the child's perspective through discussion and questionnaire and measures the frequency and effectiveness of coping strategies (Ryan-Wenger, 1990). Stability was measured by administering the SCSI to a small randomly-selected sub-group 2 weeks after the initial testing. In a primarily white school-age sample, the test-retest reliabilities were significant ($p<.0001$). The reliability for the frequency scale was $r = .73$, the reliability for the effectiveness scale was $r=.82$, and reliability of the total score was $r =.81$. Test-retest reliability over a two week period was also reported in a sample of 250 white school-age children for the frequency and effectiveness scales ($r =.73$, $r =.82$ respectively). The Frequency and Effectiveness subscales are correlated ($r=.66$, $p<.0001$).

Internal consistency for the frequency and effectiveness scale in the same sample was also evaluated. The Cronbach's coefficient alpha for the frequency scale was .76. The Cronbach's coefficient alpha for the effectiveness scale was .77. Construct validity was determined by the known-groups technique. Ryan-Wenger & Copeland (1994) compared three groups: a group without symptoms of stress; a group with one symptom; and a group with two or more symptoms. The children without stress symptoms had significantly higher frequency and effectiveness scores compared with the symptomatic groups (Huth, 1999).

In this study four additional exploratory items were added to test for rumination and intrusive thoughts as responses to stress. The four items were modified from the Response to Stress Questionnaire used for adolescents (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). The items were added to the established

format of the SCSI and were pre-tested with 7 fifth grade girls for understanding and relevance. All participants reported the use of ruminative strategies and intrusive thoughts and identified the frequency and effects of these strategies.

Self-esteem. is the self-perception or self-worth reflecting how much the individual likes himself or herself as a person in relation to perceived competence in multiple domains. This was measured by the global self worth subscale of the Self Perception Profile for Children (Harter, 1982).

The Self-Perception Profile for Children (SPPC). The SPPC is a revision of the earlier Perceived Competence Scale for Children (Harter, 1982). The focus of the scale is on the perception of children's competence in multiple domains. It is hypothesized that by 8 years of age, children judge their competence in different domains which are related to an overall sense of self-worth. General self-worth reflects how much children like themselves and is measured by a separate subscale rather than a summation of competencies. The SPPC is a self-administered questionnaire.

The SPPC consists of 36 items divided into 5 subscales representing specific domains and 1 subscale representing global self-worth. Each subscale contains 6 items. The subscale domains include Scholastic Competence, Social Acceptance, Athletic Competence, Physical Appearance, and Behavioral Conduct. Factor analysis supported the subscales with internal reliabilities ranging from .71 to .86 over 4 samples (Harter, 1985). Harter (1985) did not include the global self-worth scale in the factor analyses because it was thought that global self-worth may be related to feelings of self-concept already measured by the other subscales. The global self-worth scale is an independent

aspect of self-concept from the other subscales of competencies. This factor structure was supported in a sample of 264 gifted children in grades 5 through 7. The global self-worth subscale was used for this study. The mean global self-worth score was reported 3.43 for boys and 3.39 for girls (Rudasill & Callahan, 2008).

The subscale contains 6 items. Three of the items are worded so that the first part of the sentence describes competency. In the other three sentences the first part describes low competency. The format was developed to decrease socially desirable responses (Harter, 1982). The children are presented by two phrases with the assumption that children will either see themselves one way, or in the opposite way. Children are first asked to identify which kind of kid they are most like. Then they are asked to decide if it is sort of true or really true for them. A sample question is: “Some kids are often unhappy with themselves BUT other kids are pretty pleased with themselves”.

After choosing which type of child they identify with, they check off to what degree they are like that child. The items are scored from 1 to 4. A score of 1 for an item reflects the least positive self-judgment. A score of 4 reflects the most positive self-judgment. The score is summed and a mean is calculated**.** The range of scores for the global self-worth subscale is 1 to 4, with 4 reflecting a greater self-worth.

The adequate internal consistency of the global self-worth subscale was supported in a large longitudinal study of 2379 girls between 9 and 22 years of age. The global self-worth subscale was administered every other year and evaluated by age and developmental phase. The Cronbach’s coefficient alpha values ranged from .66 to .75 in 9- to 12-year-old black girls and .72 to .82 in 9- to 12-year-old white girls (Granleese &

Joseph, 1994). The internal consistency estimates of the global self-worth subscale for a sample of 264 children in grades 5 through 7 reported a Cronbach coefficient alpha .77. The Cronbach's Coefficient Alpha values of the domain subscales ranged between .54 (scholastic competence) and .87 (athletic competence) (Rudasill & Callahan, 2008).

Test-retest stability was tested over a three year period for 24 predominantly white children between 8 and 11 years of age. The results of the global self-worth subscale were correlated at time 1 and time 2 (r=.61, p<.001) (Granleese & Joseph, 1994).

Self-Regulation. is the attempt to modify, change, or redirect thoughts, emotions, or physiological reactions (Compas, 2001).

The Healthy Self-Regulation Subscale of the Mindful Thinking and Action Scale for Adolescents (MTASA) (West, 2008). The MTASA is a 32 item self-report questionnaire still in development that measures the concept of mindfulness in 13 to 17 year old adolescents. There are four subscales: Healthy Self-Regulation, Active attention, Awareness and Observation, and Accepting Experience. The Healthy Self-Regulation subscale was used for this study. When tested with 610 adolescents, this subscale was correlated in the expected directions with wellness indicators such as positive affect *(*r=.37, p<.01), negative affect (r=-.44, p< .01), happiness (r=.42, p<.01), feelings of unwellness (r=-.22, p<.01), and coping by the use of substances (r=-.22, p<.01). The subscale was also correlated with personality characteristics. A negative correlation was found between the subscale and neuroticism (r=-.61, p<.01) and a positive correlation with being open to new experiences (r= .33, p< .01) (West, 2008).

The Healthy Self-Regulation subscale contains 12 items. The items are scored on a six-point Likert scale with 1=almost never and 6=almost always. Three items (item 3, 6, 10) are reverse-scored. The range of scores is 12 to 72. The higher score indicates greater healthy self-regulation. The internal consistency tested by Cronbach Coefficient Alpha was reported .84. The internal consistency was not improved by the elimination of any items. Stability by retest after three to four weeks reported a correlation of .84. The corrected item to total correlations ranged from .30 to .58. Two small pilot studies with adolescents demonstrated the subscale to be sensitive to mindfulness training (A. West, personal communication, April 3, 2009). While tested with adolescents, several researchers plan to test the subscale with school-age children (A. West, personal communication, March 22, 2009).

Dose of the intervention. The dose of the intervention was defined as the number of sessions attended and number of days of home practice as measured by attendance and self report homework forms. Both measures were studied separately. Jensen & Kenny (2004) noted different effects on outcome measures between the number of yoga sessions attended and amount of yoga homework practiced by boys with ADHD. Sidani (1998) reports the dose of an intervention may be operationalized as the number of sessions attended. The impact of dose or strength and time of the intervention needs to be considered (Whittemore & Grey, 2002).

The acceptable dose of the intervention was five to six sessions, as this time has been documented as duration of mindfulness-based stress reduction in the adult literature. Howard, Kopta, Krause, & Orlinsky (1986) report 6 to 8 sessions an appropriate dose to

determine a response in psychotherapeutic treatments. The sixty minute length of the intervention session was determined by the consistency with after school program length, school bus schedules, and the pediatric yoga literature (Jensen & Kenny, 2004; Kuttner et al., 2006). The frequency of sessions (once per week for 8 weeks) was based on the adult literature of MBSR programs. The homework of 10 minutes daily of mindful movement was based on focus group data and consultation with pediatric yoga experts. Daily home mindfulness practice of 10-15 minutes may be more effective in inducing stress reduction than the recommended adult program of 45 minutes (W. Britton, personal communication, April 11, 2008).

Data Management Plan

The collected data were prepared for analysis by inspection and data, description of the sample, and psychometric testing of the instruments (Burns & Grove, 2005). Data collection forms were labeled with the participant code and forms were kept in a designated locked file cabinet to maintain confidentiality (Kohn, 2007). Data were collected and entered into the statistical program, SPSS 16. Frequencies were performed on all study variables.

The data frequency output was checked for numbers not within the range of possible scores (Burns & Grove, 2005). The numbers not corresponding to the possible range were checked against the original data collection forms, ID number, and specific variable measured. If the original data could not be evaluated, the incorrect data was declared missing (Kohn, 2007). Frequency data were evaluated for systematic or

random missing data. Random missing data were substituted with the mean of the reported values. Skewness was evaluated by Fisher's coefficient (Munro, 1986/2005).

The sample was described to allow greater evaluation of generalizability (Cummings et al., 1988/2007). Baseline sample variables were evaluated for adequate cases within each level. Measures of central tendency and dispersion were computed and summarized including frequencies, percentages, means, medians, ranges, and standard deviation (Burns & Grove, 2005).

The two independent groups were evaluated for significant differences to assess group comparability (Cummings et al., 1988/2007). The group differences of categorical variables were tested with a chi square test. Group differences of continuous and normally-distributed variables were tested with a t-test (Munro, 1986/2005). Any significant differences between groups would have been noted and used in secondary analyses (Cummings et al.) as possible covariates in subsequent analyses (Munro).

Reliability statistics of the proposed instruments were tested (Burns & Grove, 2005). Cronbach's Coefficient Alpha was used to measure internal consistency reliability (DeVellis, 2003). Cronbach's Coefficient Alpha statistics were computed on the items on the frequency scale and the effectiveness scales of the Schoolagers' Coping Inventory Scale, the Feel Bad Scale, Global Self-Worth Subscale of the Self Perception Profile for Children, and the Healthy Self-Regulation Scale of the Mindful Thinking and Action Scale for Adolescents.

Summary of the frequencies and percents of participants' baseline variables are presented in a table separated by group. There is a separate table to compare the means,

standard deviations for the separate groups. A table describes the internal consistency reliability coefficients for the Feel Bad Scale, the frequency and effectiveness scale subscales of the SCSI, the global self worth subscale of the SPPC, and the Healthy Self-Regulation Scale of the MTASA.

Data Analysis Plan

Test of Study Hypotheses. The following hypotheses were tested:

1. School-age girls who participate in mindful movement stress reduction will report significantly less perceived stress, significantly greater effectiveness and number of coping strategies, significantly greater self-esteem, and significantly greater self-regulation than school-age girls who participate in a wait-list control group.

A Multivariate analysis of variance (MANOVA) with repeated measures at two time points (baseline, week 8) with intent to treat analysis was to be used to test the above hypotheses. However, during the initial analysis of variance (ANOVA) to investigate the individual effects of the independent variable on the outcome variable, no statistical significance was noted. The MANOVA is less powerful than the ANOVA in detecting differences and more difficult to reject the null hypothesis (Polit, 1996). Therefore, multiple ANOVAs with Bonferroni correction were used to test the above hypotheses. The Bonferroni correction is the statistical manipulation to guard against statistical error (Munro, 1986/2005).

The Bonferroni correction results from dividing the desired alpha level by the number of tested hypotheses (Browner et al., 2007). However, Browner et al. suggests that the routine use of the Bonferroni correction is too stringent and should be reserved

for use with ten or more hypotheses or when the likelihood or risk of a false positive hypothesis is great. However, the Bonferroni correction was used in this study. The alpha significance level for five outcome variables was set at .01 (Munro, 1986/2005).

The intention to treat analysis compares the outcomes between the study groups based on the original randomized participant assignment. This may underestimate the actual intervention effect, but guards against potentially biased results. Analyses such as per protocol or the as treated approach to data do not account for possible participant characteristics that may affect adherence and provide important information about the intervention (Grady et al., 1988/2007). Correlations between pre and post test scale scores were calculated and the means graphed. Transformation of skewed data was considered.

2. The dose of mindful movement is inversely correlated with perceived stress and positively correlated with effectiveness and number of coping strategies, self-esteem, and self-regulation.

The outcome variables were regressed with the dose of the intervention received as independent variables (Sidani, 1998). The dose of the intervention was defined as the number of sessions attended measured by attendance records and the number of days of home practice measured by self-report homework forms. The regression of the dose of intervention that was received by the participants was included as an independent variable with the assumption that the dose can vary unsystematically across the participants. The number of sessions attended and the amount of home yoga practice were entered simultaneously as predictor variables since there was no theoretical basis to

support one independent variable being more predictive than the other. This test augmented the intent to treat analysis which assumed that the treatment was delivered and scheduled by taking into account the amount of the intervention received by the participants (Sidani, 1998).

CHAPTER FOUR

Results

The results of this two group experimental cluster randomized study designed to establish the efficacy of an eight week mindful movement program as a strategy to reduce perceived stress, enhance coping, enhance self esteem and self regulation in school-age girls will be presented. The impact of the intervention dose on these outcomes was also investigated. Two research questions were addressed:

1. To what extent do school-age girls who participate in an eight week mindful movement intervention report significantly different levels of perceived stress, effectiveness and number of coping strategies, levels of self-esteem, and levels of self-regulation than girls in a wait-list control group?

2. To what extent is the dose of mindful movement inversely correlated with perceived stress and positively correlated with effectiveness and number of reported coping strategies, self-esteem, and self-regulation in school-age girls?

The data were analyzed by an intention to treat analysis to include all participants randomized to their respective groups regardless of treatment received (Hulley, Cummings, Browner, Grady, & Newman, 2007; Wright & Sim, 2003). The intervention group data were further analyzed by the dose of the intervention (number of sessions attended and home yoga practice).

Recruitment and Participant Flow

Recruitment letters, consents, assents, and demographic forms were mailed home to parents of all fourth and fifth grade girls in the intervention school and put in student

backpacks in the control school due to principal preference the second week of the school year (9/8/09). All responses were due by September 15, 2009 to a designated sealed box in the school health office. The investigator expected that one week would be enough time for parents and students to decide whether or not to participate. The intent was to complete the intervention prior to the start of the winter holidays. In the intervention school, 200 recruitment letters were sent and 77 responses were received by the due date (38.5% response rate). Two of the original respondents could not participate due to illness at week one.

In the control school 225 letters were sent. There were 106 responses (47% response rate). Three of the randomized participants did not come to the Time 1 data collection session. However, the day of the first data collection in the control school 12 girls arrived with proper consent and forms, but had not returned the forms by the due date. The decision was made by the investigator and school nurse to include the girls in the study because the school buses had already left and the alternative was to use the designated time to contact parents rather than conduct the study group. All but one of these 12 girls completed Time 2 data.

The intervention consisted of eight sessions of mindfulness training (9/21/09 through 11/23/09). The three separate session groups met on Mondays, Tuesdays, and Thursdays. The Tuesday and Thursday sessions met from September 22 to November 12, 2009. Due to two Monday school holidays (Yom Kippur and Columbus Day) the Monday sessions lasted two additional weeks (November 23, 2009) to complete a total of eight sessions. All sessions met immediately after school in the same room from 2:35pm

to 3:30pm. The control school participants met twice: September 17, 2009 for Time 1 data collection and November 19, 2009 for Time 2 data collection. The intervention school district provides a fee-based late bus service for students attending after school activities. The control school district requires parent pick up for students after school hours.

The complete sample at Time 1 included 190 girls. The flow of participants is described in Figure 2. The intervention school included 75 girls at time 1. The control school included 115 girls at time 1. Participants who were missing greater than 40% of at least one of the four outcome scales (intervention n=3; control n=20) were excluded from analysis. One participant in the intervention school did not start the intervention due to other commitments.

The intervention group consisted of 74 participants who began the intervention. The control group consisted of 95 participants. Many girls missed individual session due to scheduled appointments.

Several participants in the control group were missing greater than 40% of at least one scale at Time 2 (n=3) and seven participants were lost to follow-up. The attendance at the last session (week 8) was affected by a mandatory band rehearsal at the intervention school. Participants were asked to come another day that week to fill out questionnaires. If participants were not able to attend another day, they were given the questionnaires and asked to return them to the school nurse within a week (n=12). All but one questionnaire was returned (n=11). Eleven of the twelve participants needed to be reminded by e-mail and phone calls to return the questionnaires. One girl did not respond

to follow-up attempts. The analyzed sample included 70 participants in the intervention group and 85 in the control group (n=155).

Sixty-one percent (n=43) of the intervention group attended all eight sessions (Table 7). The mean number of sessions attended by the intervention group was 7.4 (SD=1.09). The attendance rate dropped steadily as the study progressed (Table 8). Two participants needed to change session days due to the school play and missed two sessions.

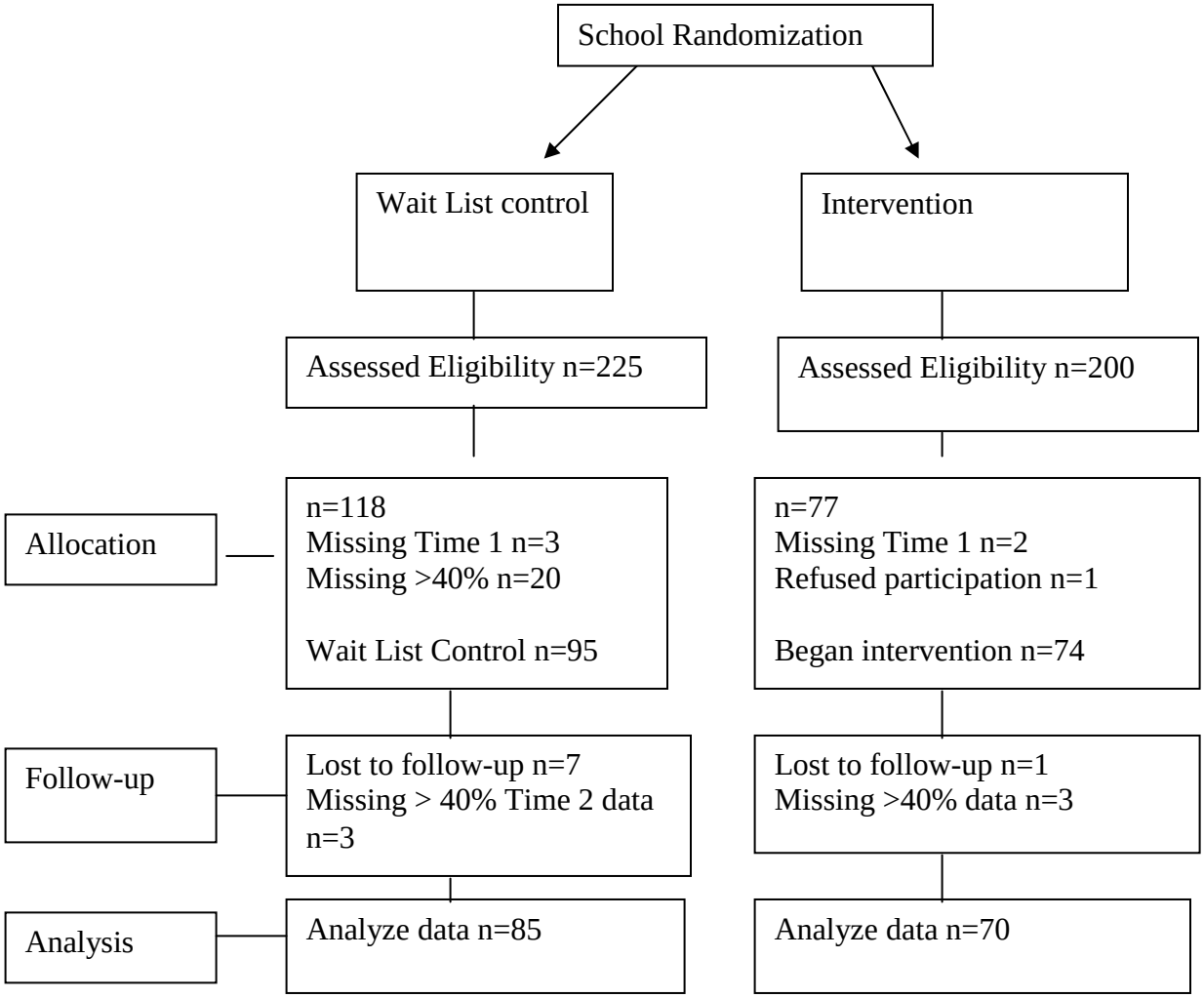

Figure 2. *Flow of Participants through the Study*

Table 7. *Total Number of Sessions Attended by Participants*

Total Sessions Attended	Participants (analyzed sample n=70)
3	2 (2.9%)
5	3 (4.3%)
6	4 (5.7%)
7	18(25.7%)
8	43 (61.4%)

Table 8. *Weekly Session Attendance by Participants*

Scheduled Sessions	Participants in Attendance (analyzed sample n=70)
1	70 (100%)
2	68 (97.1%)
3	66 (94.3%)
4	68 (97.1%)
5	67 (95.7%)
6	62 (88.6%)
7	57 (81.4%)
8[a]	57 (81.4%)

[a] Mandatory band and chorus practice after school

Setting and Sample

The schools were chosen based on demographic comparability on publicly-accessible data. The town population, median family income, school size and population, and ethnic/racial distribution were compared. The school principals were interviewed regarding interest and support. The schools were randomized into the intervention and wait list control school.

This study was limited to fourth and fifth grade girls attending Massachusetts public schools. Inclusion criteria consisted of students who were: 1) willing to participate in a weekly class for the length of the intervention; 2) willing to complete daily homework six days each week; 3) able to speak, read, and write the English language; 4) pay attention for one hour; and 5) able to participate in physical poses. Students with a history of formal mindfulness or yoga training or a developmental disorder as determined by the need for special education one to one assistance were excluded from the study.

The demographic questionnaire and information included marital status, race/ethnicity, religion, parental education and employment, participant grade, age, health problem, or recent family stress. Most families reported no recent family stress (85.1%) and no current participant health problem (n=131, 85.1%). The families who reported stressors cited grandparent illness, family death, recent move, unemployed parent, or resolving domestic abuse. Individual participant characteristics are described in Table 9. The health problems reported included asthma, allergies, headaches, back pain or history of broken bones. The participants were primarily in fifth grade (n=91, 58.7%) and 10 years of age (n=80, 51.6%). The age of the sample (n=155) included 8 years of age (n=2,

1.3%), 9 years (n=41, 26.5%), 10 years (n=80, 51.6%) and 11 years (n=32, 20.6%). The mean age in years was 9.9 (SD ±.720).

The demographic description of the sample is described in Table 10. The participants' parents were primarily married (85.1%), white (89%), Catholic (52.9%). The majority of parents were college educated mothers (83%), fathers (77%). Most mothers worked part time or were unemployed (64.2%) while most fathers worked full time (87.6%).

Table 9. *Baseline Participant Characteristics*

Characteristic	Total (n=155)	Intervention (n=70)	Control (n=85)
Recent Stress	(n=154)	(n=70)	(n=84)
Yes	62(40.3%)	29(41.4%)	33(39.3%)
No	92(59.7%)	41(58.6%)	51(60.7%)
Health Problem	(n=154)	(n=70)	(n=84)
Yes	23(14.9%)	9(12.9%)	14(16.7%)
No	131(85.1%)	61(87.1%)	70(83.3%)
Grade	(n=155)	(n=70)	(n=85)
Fourth	64(41.3%)	27(38.6%)	37(43.5%)
Fifth	91(58.7%)	43(61.4%)	48(56.5%)
Mean age in years[a]	(n=155)	(n=70)	(n=85)
(Standard deviation)	M= 9.9(±.720)	M=9.9(±.710)	M=9.9 (±.730)

[a] *t*=-.642 df=153

Table 10. *Baseline Family Demographic Characteristics*

Characteristic	Total Group (n=155	Intervention (n=70)	Control (n=85)
Marital Status	(n=154)	(n=70)	(n=84)
Married	131(85.1%)	59(84.3%)	72(85.7%)
Not married	23 (14.9%)	11(15.7%)	12(14.3%)
Race/ethnicity	(n=154)	(n=70)	(n=84)
White	138 (88.3%)	59(84.3%)	77(91.7%)
African American[a]	2(1.3%)	2(2.9%)	0
Asian[a]	6(3.9%)	3(4.3 %)	3(3.6%)
Latina[a]	4(2.6%)	3(4.3%)	1(1.2%)
Multiple[a]	2(1.3)	1(1.4%)	1(1.2%)
Native American[a]	2(1.3%)	1(1.4%)	1(1.2%)
Religion	(n=153)	(n=70)	(n=83)
Catholic	81(52.9%)	36(51.4%)	45(54.2%)
Jewish	22 (14.4%)	8 (11.4%)	14 (16.9%)
Protestant	22 (14.4%)	11 (15.7%)	11(13.3%)
Other	28(18.3%)	15 (21.4%)	13(15.7%)
Education			
Mother	(n=154)	(n=70)	(n=84)
HS or less	26 (16.9%)	15 (21.4%)	11 (13.1%)
College	81(52.6%)	34(48.6%)	47(56%)
Post college	47(30.5%)	21(30%)	26(31%)
Father	(n=153)	(n=69)	(n=84)
HS or less	35 (22.9%)	18(26.1%)	17(20.2%)
College	72(47.1%)	34(49.3%)	38(45.2%)
Post college	46(30.1%)	17(24.6%)	29(34.5%)
Employment			
Mother	(n=137)	(n=63)	(n=74)
Unemployed/			
Part time	88(64.2%)	41(65.1%)	47(63.5%)
Full time	49(35.8&)	22(34.9%)	27(36.5%)
Father	(n= 137)	(n=62)	(n=75)
Unemployed/			
Part time	17(12.4%)	5(8.1%)	12(16%)
Full Time	120(87.6%)	57(91.9%)	63(84%)

[a] Groups combined to ensure adequate cases per cell for Pearson Chi Square analysis.

Instruments and Measurement

The Feel Bad Scale (FBS). measures perceived stress. The scale consisted of two columns of 20 items each. The first column measured the perceived "badness" of listed stressors. The second column measured the frequency of occurrence of those same stressors. Both columns were scored on a five-point Likert scale ranging from 1 (not bad) to 5 (terrible) for badness and 1 (never) to 5 (all the time) for the frequency column. The item value was obtained by multiplying the item value in column one and the item value in column two. The total score was calculated by adding the item products. The possible range of scores was 20 to 500. The higher the score, the higher the perceived stress reported. The pre and post-test correlations are presented in Table 11.

Internal consistency reliability was tested by the Cronbach Coefficient Alpha. The Cronbach Coefficient Alpha at Time 1 for both groups is reported in Table 12. The mean pre and post-test scores are reported in Table 13. Corrected Item-total correlations in the intervention group ranged from .217 (fighting with your parents about house rules) to .566 (not spending enough time with your mom or dad). The corrected item-total correlations in the control group ranged from.187 (being smaller than others your age) to .649 (having your parents argue in front of you). The deletion of any items in the intervention group would not have raised the Cronbach's Alpha. However, multiple kurtotic items were noted including having your parents separate (5.49); moving from one place to another (12.49); not getting along with your teacher (15.11); not having enough money to spend (5.29); being smaller than others your age (10.77); and "feeling like your body is changing (7.84). The corrected item-total correlations of these items

ranged from .265 (not getting along with your teacher) to .505 (not having enough money to spend). All the items contributed to the scale.

The items, “not getting along with your teacher” and “being smaller than others your age” were also kurtotic in the control group (19, 5.55 respectively). Corrected item-total correlations were .508 for “not getting along with your teacher” and .254 for “being smaller than others your age”. Both also contributed to the total score. The deletion of “being smaller than others your age would have raised the Cronbach’s Alpha value to .852 from .844.

The kurtosis of these items most likely reflected the variability of the sample. Most families reported being married, therefore making the experience of parental separation rare. Getting along with teachers may also be a common experience in elementary school. The low reported experience “being smaller” and “feeling like your body is changing” may have also reflected the physical development of fourth and fifth graders who have not experienced the growth spurt and variability of size and physical development of adolescence.

Several other items for the control group would have raised the Cronbach’s Alpha value to .846 to .847; including “being pressured to try something new”, “changing schools”, and “being late for school”. These items were slightly kurtotic and skewed, and had lower corrected item-total correlations (.256, .222, .237, respectively), but deletion from the scale would have minimally raised the Cronbach’s alpha. All items were retained due to corrected item-total correlations that contributed to the total score and minimal or no increase in the Cronbach’s Alpha.

The internal consistency at Time 2 was also adequate in both groups. The corrected item-total correlations for the intervention group ranged from .156 (being smaller than others your age) to .636 (being pressured to get good grades). The corrected item-total correlations for the control group ranged from .253 (being overweight or bigger than others your age) to .661 (being pressured to get good grades).

The deletion of any item in the intervention group would not have raised the Cronbach's Alpha value. The only item in the control that would raise the Cronbach's Alpha value from .885 to .886 was "being overweight or bigger than others your age", corrected item-total correlation=.253. This item was retained due to contribution to the scale, minimal increase in the Cronbach's Alpha value, and to maintain the integrity of the scale.

Table 11. *Pre and Post-test Correlations of Outcome Measures*

Scale	Intervention (n=70)	Control (n=85)
FBS[a]	.67**	.75**
SCSIF[b]	.77**	.70**
SCSIE[b]	.70**	.61**
SPPC[c]	.63**	.67**
MTASA[d]	.73**	.69**

Note. [a]Feel Bad Scale, [b]Schoolagers' Coping Strategies Inventory Frequency and effectiveness subscale, [c]Self Perception Profile for Children Global Self Worth subscale, [d] Mindful Thinking and Action Scale for Adolescents Healthy Self-Regulation Subscale.

**Pearson Correlation, *p*=.01 (2-tailed)

Table 12. *Internal Consistency Reliablities (Cronbach's Coefficient Alpha)*

	Time One			Time Two		
Scale	Total (n=155)	Intervention (n=70)	Control (n=85)	Total (n=155)	Intervention (n=70)	Control (n=85)
FBS[a]	.85	.86	.84	.87	.85	.89
SCSIF	.81	.83	.79	.82	.85	.80
SCSIE	.76	.74	.77	.78	.77	.78
SPPC	.76	.76	.76	.80	.78	.82
MTASA	.81	.85	.76	.87	.88	.86

[a] FBS-Feel Bad Scale, SCSIF-Schoolagers' Coping Strategies Inventory Frequency subscale, SCSIE- Schoolagers' Coping Strategies Inventory Effectiveness subscale, SPPC-Global self-worth subscale of the Self Perception Profile for Children,MTASA-Mindful Thinking and Action Scale for Adolescents, Healthy Self-Regulation subscale,

Table 13. *Mean Scores Pre and Post Intervention*

	Time One		Time Two	
Scale	Intervention (n=70)	Control (n=85)	Intervention (n=70)	Control (n=85)
FBS[a]	104.5 (±43.7)	111.4 (±43.8)	112.2 (±46.6)	108.6 (±46.7)
SCSIF[b]	27.8 (±10.1)	29.7 (±9.1)	29.5 (±11.2)	28.9 (±9.3)
SCSIE[b]	36.0 (±9.6)	35.1 (±9.7)	35.4 (±10.2)	33.7 (±9.9)
SPPC[c]	3.3 (±.60)	3.3 (±.56)	3.4 (±.54)	3.5 (±.54)
MTASA[d]	49.9 (±11.7)	49.2 (±9.7)	52.2 (±12.1)	51.8 (±11.6)

Note. [a]Feel Bad Scale, [b]Schoolagers' Coping Strategies Inventory Frequency and Effectiveness , [c]Self Perception Profile for Children Global Self Worth subscale, [d] Mindful Thinking and Action Scale for Adolescents Healthy Self-Regulation Subscale.

The Schoolagers' Coping Strategies Inventory (SCSI). measures the construct of stress coping strategies. It consisted of two 26-item subscales; coping frequency and coping effectiveness. Each subscale was scored on a three-point Likert scale. The frequency ranged from 0 (never) to 3 (most of the time) and the effectiveness subscale ranged from 0 (never do it) to 3 (helps a lot). The possible scores ranged from 0 to 72. The item values were summed for two separate subscale scores.

The number of strategies was not counted due to missing data to which the mean could not be imputed. The coping frequency subscale score was used instead, to measure changes in coping ability. It measured how often children were able access their repertoire of coping strategies in order to deal with a stressful encounter. The total score for both groups was normally distributed. The deletion of one of five items would have raised the Cronbach's Alpha value. The greatest increase in value would have been from the deletion of "do work around the house" which would have raised the Cronbach's alpha value from .831 to .838. The corrected item-total correlation was .171. The corrected item-total correlation for this item in the control group was .321 and the deletion of this item would have slightly raised the Cronbach's Alpha from .793 to .794.

The item "pick on someone" was highly kurtotic (12.239) with a corrected item-total correlation of .179. This item was also kurtotic (6.411) in the control group with a corrected item-total correlation of .113. The deletion of this item would have raised the Cronbach's Alpha from .831 to .835 in the intervention group and would have raised the Cronbach's Alpha from .793 to .801 in the control group.

The kurtosis may have reflected variability of the sample. Many participants may not have considered house work as a way to manage stress. The low report of “pick on someone” may have reflected the lack of use of this strategy for girls in this sample.

In the control group the deletion of the item “bite my nails or crack my knuckles” would have raised the Cronbach’s Alpha value the greatest amount from .793 to .806. The corrected item-total correlation was. 099 and the item did not contribute much to the total. However, after the deletion of this item the Cronbach’s Alpha value only increased to .796. The corrected item-total correlation for this item in the Intervention group was .393, contributing to the total score. All items were retained due to contribution to the scale, minimal increase in Cronbach’s Alpha, and integrity of the scale.

At Time 2 the deletion of multiple items in the intervention group would have raised the Cronbach’s alpha value minimally, with the greatest raise from the deletion of either “hit, throw, or break things” or “pick on someone”. The deletion of either of these items would have raised the Cronbach’s Alpha value from .846 to .856. The corrected item-total correlation for “hit, throw or break things” was .181, and for “pick on someone” was .070. The item “pick on someone” in the control group had a corrected item-total correlation of.171 and if deleted, would have raised the Cronbach’s Alpha value from .796 to .802. This item for both groups was kurtotic (intervention group, 5.59 and control group, 12.58). The variability of this item may have reflected the variation in this sample of girls or the hesitancy to admit to picking on someone.

Eight other items in the control group would have slightly raised the Cronbach’s Coefficient Alpha value, but the corrected item-total correlations ranged from .107 to

.327. All items contributed to the total score and all were retained. The Cronbach's Apha values were adequate for both samples at both time points and total scores approximated a normal distribution. The frequency and effectiveness subscales were found to be significantly correlated in the intervention group (r=.85, p =.01) and the control group (r=75, p=.01). The subscales remained correlated at Time 2 in the intervention group *(*r=.80, p=.01) and control group (r=.74, p=01).

The Effectiveness subscale needs to be interpreted with caution due to an error in response choices that may have underestimated coping effectiveness. The Cronbach's Alpha values were adequate at both time points. However, multiple items if deleted in both groups would have minimally raised the Cronbach's Alpha value. Two items at Time 1 in the intervention group had a negative corrected item-total correlation: "be alone" (-.012) and "hit, throw, break" (-.010). These items in the control group had low contribution (.098, .082, respectively). At Time 2 "be alone" remained negative (-.042) in the intervention group. At Time 2 items in the control group that had a negative corrected item-total correlation included: "hit, throw or break (-.019) and "pick on someone" (-.006). These items in the intervention group had corrected item-total correlations of .186 and .167, respectively. Due to the reported error in the response choices and negatively loading items the effectiveness subscale was reported, but with cautious interpretation.

The Global Self-Worth subscale of the Self-Perception Profile for Children (SPPC). consisted of 6 items that presented two types of child. The participants chose which type of child was most like herself. It was measured on a four point Likert scale from 1 (really true for me) about a negative statement to 4 (really true for me) regarding a

positive statement. The item values were added and the mean calculated for a possible score of 1 to 4. A higher score indicated a greater reported perceived self esteem. At Time 1 the Cronbach's Coefficient Alpha values were adequate for both groups (Table 12). The intervention group item-total correlations ranged from .416 (some kids like the kind of person they are) to .566 (think the way they do things is fine). The control group item-total correlations ranged from .416 (some kids are happy being the way they are) to .544 (like the way they are leading their life).

The total score was kurtotic in the intervention (-.111) and the control group (-512). This kurtosis persisted at Time 2 in the intervention group (-.272) and the control group (.185) and was resistant to transformation**.** This may have reflected the developmental stage of the sample that may have higher levels of self-esteem at preadolescence. The scale may not be sensitive to higher levels of self-esteem. The deletion of any item at Time 1 or Time 2 would not raise the Cronbach's Alpha value.

The Healthy Self Regulation subscale of the Mindful Thinking and Action Scale for Adolescents. measured healthy self-regulation. It consisted of 12 items scored on a six point Likert scale from 1 (almost never) to 6 (almost always). The scale was computed by adding the individual item values for a possible score of 12 to 72. The higher the score the greater the reported self regulation. Items 3 (I need to get revenge if I'm insulted), 6 (my anger comes on too fast for me to stay in control), and 10 (I am known to lose my temper) were reverse scored.

The Cronbach's Coefficient Alpha was adequate for both groups at both time points. In the intervention group the item-total correlations ranged from .346 (I am

known to lose my temper) to.683 (I am patient with others). The control group item-total correlations ranged from .212 (I accept myself even if I still have things to learn) to .545 (I recognize when I'm getting upset and calm myself down). The total score had a normal distribution. In the control group, the deletion of the item, "I accept myself even if I still have things to learn" would have raised the Cronbach's Alpha value from .763 to .764. The corrected item-total correlation was .212 in the control group and .467 in the intervention group. The item was retained due to the contribution of the item, normally distributed total score, and minimal increase in Cronbach's Alpha value.

The Cronbach's Coefficient Alpha values were higher at Time 2. The greatest increase was in the control group. The intervention group item-total correlations ranged from .368 (I need to get revenge if I'm insulted) to .702 (I have healthy and natural way to relax). The control group item-total correlations ranged from .400 (I accept myself even if I still have things to learn) to .740 (I recognize when I'm getting upset and calm myself down). The deletion of any item would not have raised the Cronbach's Alpha value.

Baseline Data

To test for the assumption of baseline equality of groups, descriptive statistics were evaluated and group differences compared by Pearson chi square analysis on categorical variables and t-test on continuous variables (Tables 9 and 10). Many categorical variables needed to be recoded to ensure adequate cell counts.

The marital status categories of divorced, separated, single became "nonmarried". There were no significant differences detected between groups χ^2 (1, n=154) =.061, p=

.804. The race/ethnicity categories of African American, Asian, Latina, multiple, Native American, and other were combined as one category. No significant differences between groups was detected between groups χ^2 (1, n=154) = 2.11, p =.146. The reported religions of Hindu, mixed, and other were joined as one category. No significant group difference were noted χ^2 (3, n=153) =.1.68, p = .640. Parental education was recoded to include "less than high school" with "high school". No difference was noted for maternal χ^2 (2, n = 154) = 1.97, p = .372 or paternal education χ^2(2, n=153) =1.92, p= .381 between groups. Employment was also recoded to join unemployed with working part time compared to full time employment for mothers. No group differences were note for mothers' employment χ^2 (1, n=137) = .036, p = .849 or fathers' employment χ^2 (1, n=137) =1.96, p = .161.

The individual participant characteristics did not differ significantly in recent stress χ^2 (1, n=154) =.073, p =.787 or the presence of a health problem χ^2 (1, n=154) =436, p = .509, or grade representation χ^2 (1, N=155) =.389, p = .533. Difference in age between the groups was tested by t-test. No significant difference was noted between groups t (155) =-.642, p = .522 (two-tailed).

The intervention group and control group were compared on baseline scale scores of the Feel Bad Scale (FBS), Schoolagers' Coping Strategies Inventory Frequency (SCSIF) and Effectiveness subscale (SCSIE), global self-worth subscale of the Self Perception Profile for Children (SPPC) and Healthy Self-Regulation subscale of the Mindful Thinking and Action Scale for Adolescents (MTASA).

Differences between groups were tested by t test. A Bonferroni correction was used to evaluate statistical differences. The alpha value was set at p= .01. There was no statistically significant difference between groups on the score of FBS t (153) =-.974, p=.331 (two-tailed). No difference was noted between group score for the coping frequency scale t(153)=-1.24, p=.218 (two-tailed); healthy self-regulation subscale t(153)=.429, p=.668 (two-tailed); or the global self-worth subscale t(153)=.134, p=.736 (two-tailed).

Group Comparisons

The following hypotheses were tested:

1. School-age girls who participate in mindful movement stress reduction will report significantly less perceived stress, significantly greater effectiveness and number of coping strategies, significantly greater self-esteem, and significantly greater self-regulation than school-age girls who participate in a wait-list control group.
2. The dose of mindful movement is inversely correlated with perceived stress and positively correlated with effectiveness and number of coping strategies, self-esteem, and self-regulation.

Research Hypothesis #1

Repeated Measures-Analysis of Variance (ANOVA) with Bonferroni correction was used to test within-subjects and between subjects differences between the intervention and control group. The significance level was .01 to avoid type I statistical error due to testing five outcome variables. The group of fourth and fifth grade girls with two levels (intervention and wait-list control) was entered as the between-subjects factor.

Time with two levels (pretest and post-test) was entered as the within subjects factor. The two groups over two time points resulted in equal multivariate and univariate values. The univariate results are reported for all outcomes.

Perceived Stress

Perceived Stress was measured by the Feel Bad Scale. The univariate results for the within subjects factor are reported. There was no significant effect for time F(1)=.824, p=.366. No significant difference in perceived stress was found between the intervention and control group F (1) =.060, p=.806 (Table 14). However, the interaction between time and group approached significance F (1)=3.59, p=.060, with a small effect size (η=.02). Compared to the control group, the intervention group was more likely to increase their stress scores at Time 2. The intervention group mean score increased from 104.5 (43.7) to 112.2 (46.6) while the control group score decreased from 111.4 (43.8) to 108.6 (46.7) (Figure 3.).

Table 14. *Repeated Measures ANOVA for Perceived Stress after Intervention (n=155)*

Source	*df*	MS	F	*η*	*p*
Between subjects					
Group	1	21.690	.060	.000	.806
Error	153	3511.436			
Within subjects					
Time	1	479.501	.824	.005	.366
Time x group	1	2093.146	3.595	.023	.060
Error	153	582.200			

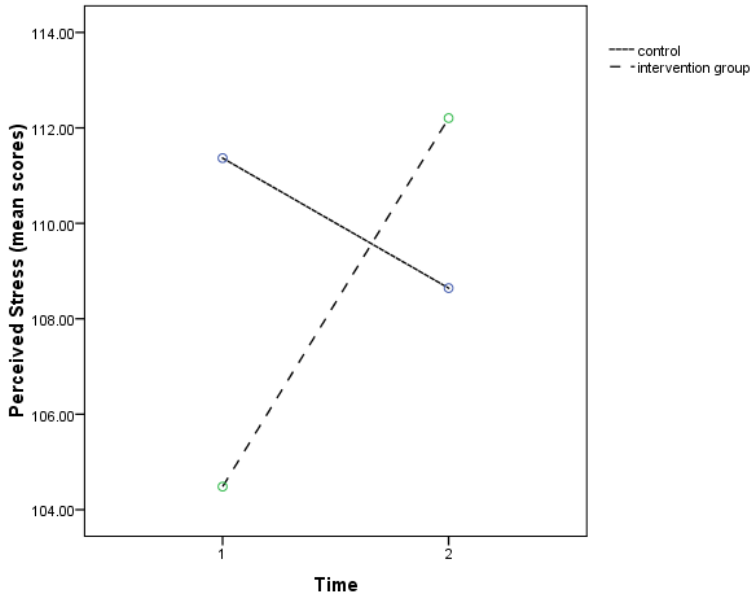

Figure 3. *Group Means of Feel Bad Scale at pretest and posttest.*

Coping

Coping was to be measured by the number of coping strategies identified and the reported effectiveness of the strategies. The exact number of strategies could not be accurately evaluated. The frequency subscale of the Schoolagers' Coping Strategies Inventory was used to measure the frequency of use of coping strategies. The measure of coping effectiveness was limited by a printing error in the effectiveness subscale of the SCSI that may have underestimated the effectiveness score. The scores of the coping effectiveness subscale are reported, but they should be interpreted with caution

Number of strategies

The actual number of strategies was limited by missing data that could not be imputed. At Time 1 the coping strategy reported as least used in both groups was “pick on someone”. Sixty participants (85.7%) in the intervention group and 70 participants (82.4%) in the control group reported this strategy as used least. The coping strategy reported most frequently as used the most in the intervention group was “try to relax and stay calm” (n=17. 24.3%) and watch TV or listening to music (n=17, 24.3%). It is unclear which strategy, TV or music, they are using. The control group participants reported using “saying I’m sorry” the most (n=25, 29.4%).

At Time 2, “pick on someone” remained the least used strategy in the intervention group (n=63, 90%) and the control group (n=77, 90.6%). The strategy most frequently reported as used the most in the intervention group was “watch TV or listen to music” (n=26, 37.1%). This strategy increased at Time 2, but “try to relax and stay calm” remained constant (n=17, 24.3%), but was not the most often cited strategy. In the control group the strategy most frequently reported as used the most remained “saying I’m sorry” with a slight increase (n=28, 32.9%).

Frequency of coping strategies

No significant differences were found between the two groups in the frequency of coping F (1) =.217, p=.64(Table 15). However, a significant interaction between group and time was found. Compared to the control group, the intervention group was more likely to increase their frequency of coping score F (1) =4.28, *p*=.04 (Figure 4). The

intervention group mean score increased from 27.8 (10.1) to 29.5 (11.2), while the control group decreased from 29.7 (9.1) to 28.9 (9.3).

Table 15. *Repeated Measures ANOVA for Frequency of Coping (n=155)*

Source	*df*	MS	F	*η*	*p*
Between subjects					
Group	1	36.745	.217	.001	.642
Error	153	169.041			
Within subjects					
Time	1	16.893	.641	.004	.425
Time x group	1	112.868	4.281*	.027	.040
Error	153	26.366			

*p <.05

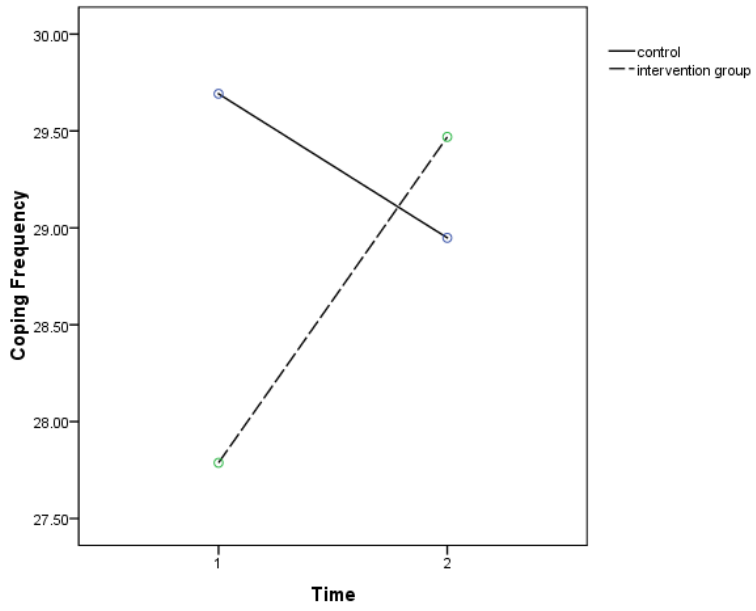

Figure 4. *Group means of Schoolagers' Coping Strategies Inventory Frequency subscale at pretest And posttest.*

Coping effectiveness

There was no significant effect over time or difference in the effectiveness between the intervention and control group F(1)=.832, *p*=.363 (Table 16). The findings of this subscale need to be interpreted with caution due to an error in response choice (Figure 5).

Table 16. *Repeated Measures ANOVA for Coping Effectiveness (n=155)*

Source	*df*	MS	F	*η*	*p*
Between subjects					
Group	1	133.218	.832	.005	.363
Error	153	160.107			
Within subjects					
Time	1	67.832	1.993	.013	.160
Time x group	1	13.357	.392	.003	.532
Error	153	34.039			

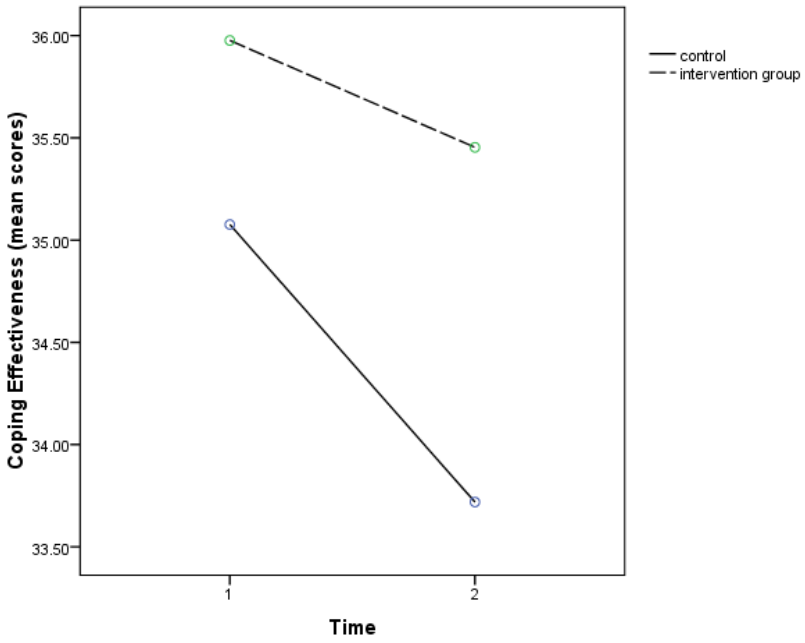

Figure 5. *Group means of Schoolagers' Coping Strategies Effectiveness subscale at pretest and posttest*

Self-esteem

Self-esteem was measured by the global self-worth subscale of the Self-Perception Profile for Children. A significant change over time in reported self-esteem was noted in both groups F(1)= 14.1, p=.000, without an interaction effect F (1)=16, p=.69 (Table 17). No significant differences between groups in change of self-esteem was found F(1)=.32, p=.573. Both groups reported a significant increase in self-esteem over the eight-week time period (Figure 6).

Table 17. *Repeated Measures ANOVA for Self-Esteem (n=155)*

Source	*df*	MS	F	η	*p*
Between subjects					
Group	1	.165	.320	.002	.537
Error	153	.516			
Within subjects					
Time	1	1.539	14.040*	.084	.000
Time x group	1	.017	.156	.001	.694
Error	153	.110			

*$p < .01$

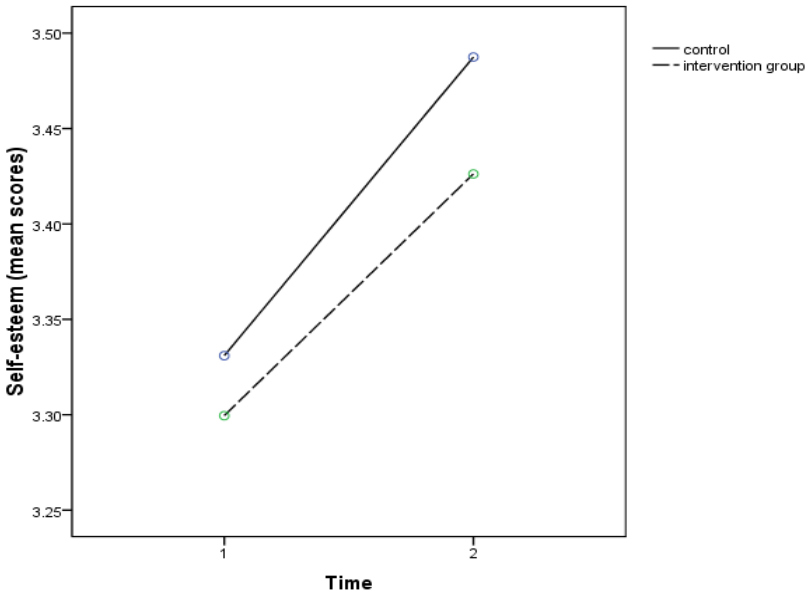

Figure 6. *Group means of Self-worth subscale at pretest and posttest*

Self-regulation

Self-regulation was measured by the Healthy Self-regulation subscale of the Mindful Thinking and Action Scale for Adolescents. A significant effect over time was

found in both groups F (1)=12.51, *p*=.001, without a significant difference between the groups in reported self-regulation F(1)=.111, *p*=.739 (Table 18). Both the intervention and control group reported an increase in self-regulation over the eight week intervention period (Figure 7).

Table 18. *Repeated Measures ANOVA for Self-regulation (n=155)*

Source	*df*	MS	F	η	*p*
Between subjects					
Group	1	24.033	.111	.001	.739
Error	153	216.093			
Within subjects					
Time	1	468.511	12.507*	.076	.001
Time x group	1	2.398	.064	.000	.801
Error	153	37.461			

* $p < .01$

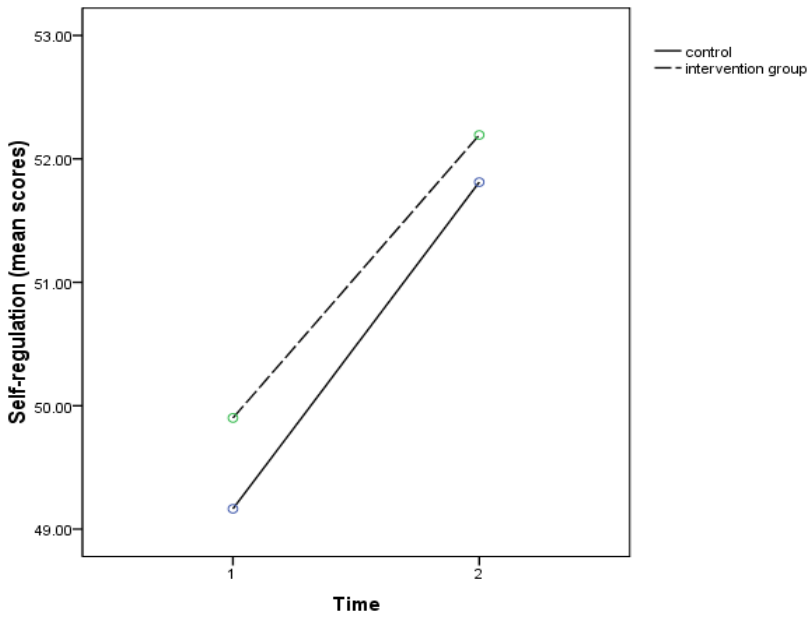

Figure 7. *Group means of Healthy Self-regulation subscale at pretest and posttest*

Research Hypothesis #2

The dose of mindful movement is inversely correlated with perceived stress and positively correlated with number and effectiveness of coping strategies, self-esteem, and self-regulation.

The dose of mindful movement was measured by the number of sessions attended measured by weekly attendance and the amount of home practice of yoga measured by self-report. A check mark was placed next to the day the yoga was practiced at home. The length of practice or whether the CD was used was not reported.

The Monday group had two extra weeks to practice the yoga, but only one participant reported doing any extra home practice on the self-report form. The majority

of participants completed eight sessions (n=43, 61.4%). The range of session attendance was between 3 and 8 sessions. The mean attendance for the participants (n=70) was 7.4 (±1.1) sessions. The range of home yoga practice was between 0 to 42 times with a mean reported time of home practice of 10.8 (±9.6) times.

The dose was examined as two independent variables. Descriptive statistics and frequencies were used to determine adequate number of cases per variable. The correlations between yoga practice times, attendance, and the outcome measures; perceived stress, coping, self-esteem and self-regulation were evaluated (Table 19).

Table 19. *Correlations between Intervention Dose and Post –Intervention Outcomes* (n=70)

	FBS[a]	SCSIF[b]	SCSIE[b]	SPPC[c]	MTASA[d]	Attendance	Yoga
FBS	1						
SCSIF	.64**	1					
SCSIE	.48**	.80**	1				
SPPC	-.26*	-.18	-.15	1			
MTASA	-.04	.04	.11	.59**	1		
Attendance[e]	.01	.07	.01	.16	.18	1	
Yoga[e]	.29*	.08	-.01	-.06	.14	.26*	1

Note. [a]Feel Bad Scale, [b]Schoolagers' Coping Strategies Inventory Frequency and effectiveness subscale, [c]Self Perception Profile for Children Global Self Worth subscale, [d] Mindful Thinking and Action Scale for Adolescents Healthy Self-Regulation Subscale. [e]Attendance and yoga represent the received dose of the intervention.

* Pearson Correlation coefficient, p=.05 (two-tailed)

***p*=.01(two-tailed)

No significant difference between the outcome measures between the intervention and control groups was found. The only significant correlation between the predictor variables (attendance and home yoga practice) and criterion variables (stress, coping, self-esteem, and self-regulation) was between home yoga practice and perceived stress (r=.29, p=.05). The two predictor variables were also significantly correlated (r=.26, p=.05).

The scatter plot for home yoga practice and perceived stress suggested the possibility of a linear relationship. The scatter plot using attendance as the predictor variable did not suggest a linear relationship. The predictor variables, home yoga and attendance were entered simultaneously into a regression model. The correlation between attendance and perceived stress was not significantly correlated and contributed little to the variability of perceived stress (r=.010, p=.466).

The correlation coefficient between the observed and predicted values when home yoga was the predictor was R =.296. The standard error of estimate (45.17) was smaller than the standard deviation of the dependent variable (46.61). The proportion of variability of perceived stress that may be accounted for in the model was 6.1% (R square=.088, Adjusted R Square=.061). The ANOVA supported the linear relationship between the predictor and criterion variable F (2) =3.23, p=.046. The amount of home yoga practice significantly predicted change in perceived stress. The B weight for attendance was negative (-2.91, p=.575), suggesting collinearity with the home yoga practice. However, the multicolinearity diagnostic**s** between the independent variables, home yoga practice and total session attendance reported high tolerance (.935) and low

variance inflation factor (1.070), suggesting that collinearity was not a significant problem in this model and that home yoga was a primary predictor.

To check for violations of the assumptions of regression the residuals were tested by checking normality of the standardized residuals. The histogram approximated normal distribution. To check for linearity the standardized residuals were plotted against the predicted values of the dependent variable and against the independent variables (Munro, 1986/2005).

The final model of regression included home yoga practice as the only independent variable, accounting for 7% (Adjusted R Square=.07) of the variance in perceived stress (Table 20). The ANOVA supported the linear relation between the predictor and criterion variable $F(1)=6.17$, $p=.015$. The residuals were analyzed to test linear assumptions (Munro, 1986/2005; Norušis, 2005). The residuals approximated normal distribution (Figure 8). The P-P Plot shows peaks above and below the mean, but fall close to the line, suggesting linearity (Figure 9). The standardized predicted values plotted against the observed data clustered as expected (Figure 10) (Munro, 1986/2005).

Table 20. *Regression Analysis for Variables Predicting Perceived Stress (n=70)*

Variable	B	SE B	β	95% Confidence Interval
Home yoga practice	1.40	.563	.289*	.278-2.52

*$p=.015$

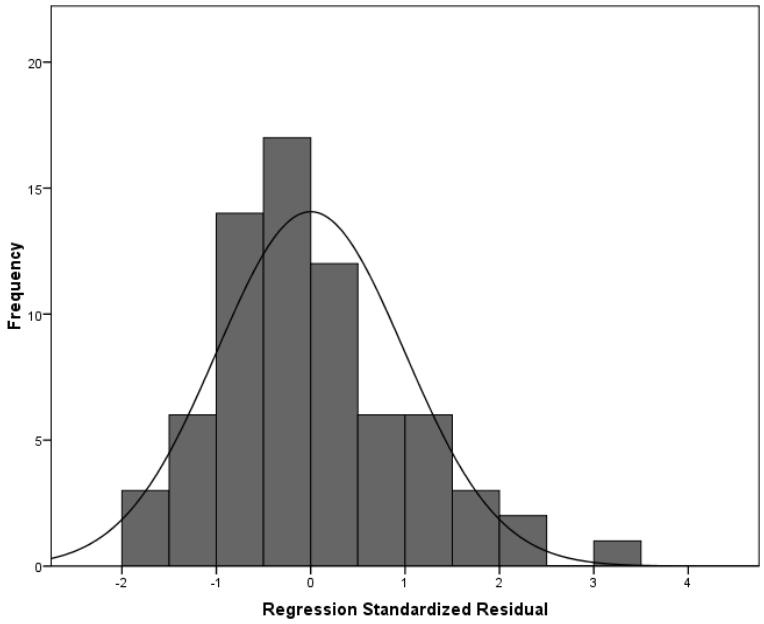

Figure 8. *Distribution of Standardized Residuals (perceived stress and home yoga practice)*

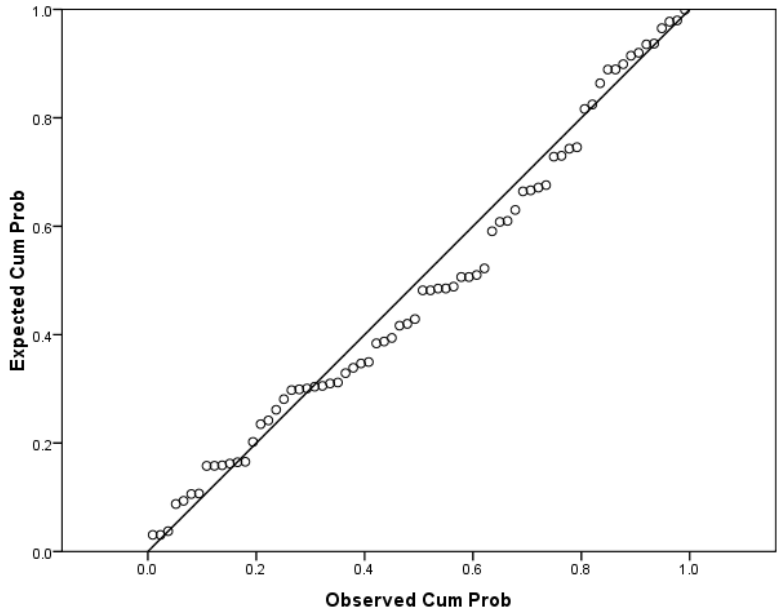

Figure 9. *Normal P-P Plot of Regression Standardized Residual*

Dependent Variable: Perceived Stress

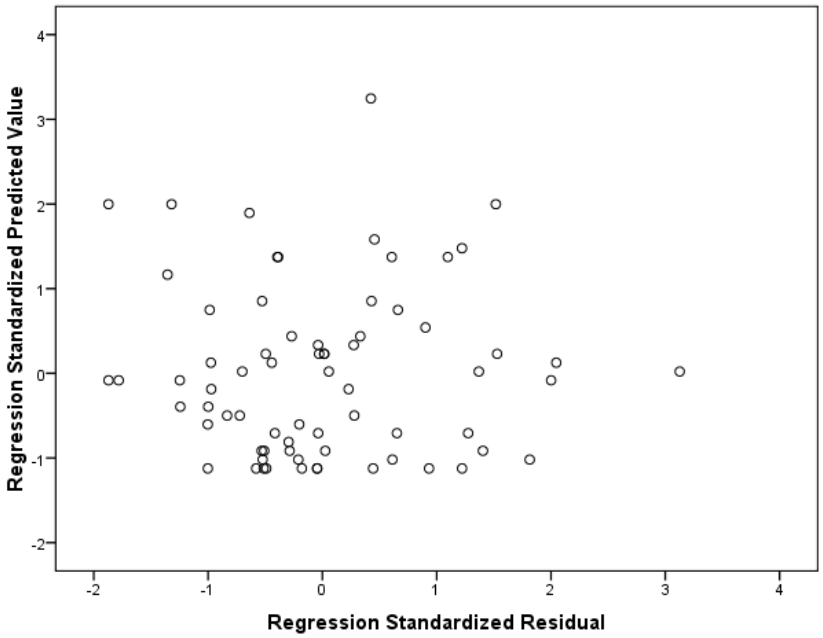

Figure 10. *Scatter plot of Standardized Regression Residuals*

Dependent Variable: Perceived Stress

The total amount of yoga home practice significantly accounted for a very small variance in reported perceived stress (7%). The increase in the amount of home yoga practice predicted an increase in reported perceived stress.

Supplemental Analyses

To further explore the increasing stress scores, the two subscales (“Badness” and “frequency”) of the FBS were evaluated separately. The frequency of occurrence of stressors was similar in both groups at both time points. A difference between pretest and

posttest group mean scores for the “badness” was found. The “badness” subscale asks how badly you would or did feel when or if the stressor occurred (stress appraisal). The Cronbach’s Coefficient Alpha in the intervention group was .91 and in the control group was .89. At Time 2 the Cronbach’s Coefficient Alpha in the intervention group was .88 and in the control group was .91.

No between-group differences were found in the “badness” scores $F(1)=1.15$, $p=.283$. However, a significant interaction was found between group and time $F(1)=8.15$, $p=.005$ with a medium effect size ($\eta=.05$) (Table 21).

Compared to the control group, the intervention group was more likely to increase their “badness” scores at Time 2 (Figure 11). The mean “badness” scores increased in the intervention group from 53.3 (15.86) to 58.04 (16.04) and decreased in the control group from 59.22 (14.85) to 56.87 (16.05).

To further investigate the increased “badness” scores, the relationship between the badness scores and coping was explored. In the control group, the “badness” scores were significantly correlated with the frequency of coping at both time points. In the intervention group, the “badness” scores were not correlated with the frequency of coping at Time 1($r=.21$). However, at Time 2, the intervention group “badness” scores and frequency of coping scores were significantly correlated ($r=.47$, $p=.01$ two-tailed).

Table 21. Repeated Measures ANOVA for Perceived Badness (Stress Appraisal) (n=155)

Source	*df*	MS	F	η	*p*
Between subjects					
Group	1	433.493	1.159	.008	.283
Error	153	373.936			
Within subjects					
Time	1	109.377	.926	.006	.337
Time x group	1	962.327	8.146*	.051	.005
Error	153	118.140			

*$p < .01$

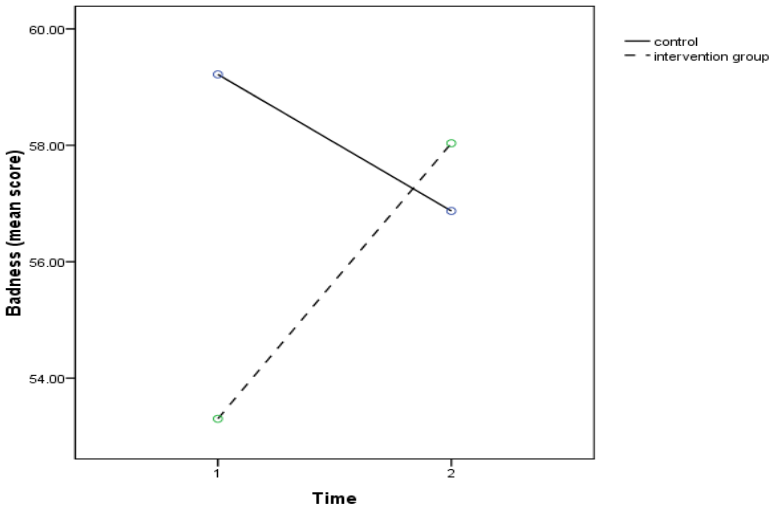

Figure 11. *Group Mean of "Badness" subscale of the Feel Bad Scale at pretest and posttest.*

Feasibility

One of the purposes of this study was to evaluate the feasibility of an after school mindfulness-based program for stress reduction for fourth and fifth grade girls. The response rates underestimated the interest of students. After the due date and through the Time 1 collection date, approximately 10 to 15 phone calls and letters requesting participation from both schools were received by the investigator and school nurses.

The feasibility of an after school mindfulness program was explored by an evaluation form at the last session. The original intent was a focus group, but due to multiple expected absences or scheduled session day changes at week eight, a written evaluation form with the focus group questions was provided and optional for participants (Table 22).

Table 22. *Evaluation Questions at Week Eight of the Intervention (n=63)*

What did you like about the yoga classes?
What didn't you like about the yoga classes?
What did you think about the homework?
What do you think should be different?
Did you teach any kids at school what you learned here?
Did anyone else practice the yoga at home with you?
Did you notice any changes in yourself?
Do you plan to continue practicing the yoga?
What are some ways that you can continue practicing the yoga and meditation?

Sixty-three participants (90%) returned the evaluation forms. The majority of participants (77%) liked the yoga poses or the feelings of relaxation or calmness. One girl

wrote “yoga lets me not stress out of my homework and my life”. Three girls mentioned the prizes. Two girls specifically liked the tinsha bells (bells rung at the beginning and end of the sessions). One participant mentioned the body scan “because it made me relax” and three girls mentioned the silence and meditations. One participant mentioned liking the teachers and another two participants liked to talk about their experiences during the week. One participant wrote that “I didn’t really like it. The yoga wasn’t what I thought it would be”. She reported not liking the homework and specifically did not like “how long the tests are,” (a reference to the questionnaires). Another participant “liked it, but I didn’t like it-yoga in general. 95% was good…5% was work”.

In response to what was not liked about the yoga classes, most participants reported not liking some poses –either too hard or too easy or named a specific pose (mouse, tree). Three participants cited the questionnaires, three thought yoga made them tired, one reported feeling more stressed, one participant did not like leaving early every week, another did not like having to retie her sneakers after class. On participant did not like how the yoga “did not work as well at home”. Five participants thought the classes were “boring” or too long, or the poses were too repetitive. One participant reported “sometimes I wasn’t in a good mood for yoga”. Three participants thought it difficult to sit still “I got antsy”, “I got restless”. Twelve participants cited classmates. One participant did not like that she “did not know anyone in the class”. Another reported “I doesn’t like the fith graders because they look tough to me” and another participant reported that “some girls that I don’t like were in it”. Participants reported “some girls were talking too much”, “other people were fooling around” “and “it was too crowded”.

In each class there were at least two girls who would not be quiet during meditation or would giggle during guided meditations and yoga poses. This was noted to be distracting and the class was repetitively asked by the interventionist before and during the class to be respectful of all the girls and when the urge to talk or giggle happens, to focus on breathing and see what happens. To prevent talkative friends from disrupting future classes, the research assistants would note the disruptive girls and separate their mats at future sessions. All the mats had been personalized by the girls and they were told that the mats would be laid out by the researchers before class to save the time of searching for their mats. Three participants cited the separation from friends and not being able to sit next to friends as something they did not like about the yoga. Eleven participants wrote there was nothing they did not like.

The homework was considered “easy” by 24 of the participants, three reported not doing it (“I didn’t do it even once”), two reported “nothing”. Sixteen of the participants reported a positive response such as “it was wonderful”, “I loved how much it relaxes you”, and it “made me think about what I was doing” and a “good idea because it got kids to do it”. One participant cited that it was” fun to get a prize”. Eighteen participants reported negative-valenced responses, seven reporting that it was “boring”. Four participants reported it was hard to do during the week, and one reported that it was “kind of annoying I had to do it all the time”. Other participants reported that it was not helpful (n=2) and another reported that it “was hard to keep track of”.

Reponses to the question of what should be different were varied, but most supported: (a) more variety in the poses (“one new pose to add each week”, “do more

things each time", "more interesting poses", "more laying down poses" and "more interesting activities and more imagination sessions"); (b) homework ("not have homework", CD shorter and didn't have to practice as often", "give people different CD's and trade every class", " take the mats home every week");(c) questionnaires ("how long the tests are"; and (d) behavior (change "the way we act", "don't put kids who fool around together"). One participant suggested a snack and another suggested to "tell kids to wear sweat pants". One participant reported "we should talk more and laugh." Eleven participants reported that they would change "nothing".

The question of whether participants taught other students was to assess intervention diffusion. Two school sites were chosen rather than randomizing participants in one school specifically to avoid diffusion of the intervention to the control group. The majority of students did not teach other students (Table 23). One girl reported that she was "afraid they would laugh", another reported intent to teach others "not yet". One girl responded "no way. I keep things to myself at times" and another answered no and wrote "sorry" as if she assumed that the question implied she should have taught others. Two girls reported teaching the physical education teacher.

Many participants practiced the yoga at home with family members, mostly mothers, and plan to continue to practice the yoga and meditation (Table 22). Many participants also reported noticing changes in themselves with the program. Most participants reported feeling more calm and relaxed, quiet or relaxed faster, felt more flexible. One girl reported less physical pain in her back. Three responses in particular suggest mindfulness; "I noticed there was stress in me and after there wasn't", "I noticed

that I notice how I feel more", and "I made better choices with my issues". Many participants reported no noted changes in themselves "I stayed the same grrrrr (didn't do home work)".

Eight of the participants who plan to continue a yoga practice cited the CD as a way to continue their home practice, the pictorial yoga poses, or use the STOP sign tool while another girl stated "I can get them into my mind and do them whenever I want to. The body scan was mentioned once and meditation was mentioned twice. It is unclear if is this was the quiet sitting meditation, loving-kindess meditation, or affirmation taught in class. Two participants reported focusing on the breath "take a deep breath", "if I am mad at someone just breathe in and out!" One participant reported that she will use the Wii® yoga program to practice yoga "because my sister always does it so I know I can". Two participants reported going to "a quiet place where one could go to" or "staying by myself in a dark room with lit candles". Others reported that they would continue meditation when they are bored or when doing other things "when I play the clarinet", "when I play with neighborhood to teach them", "in the car to feel less car sick". Four girls stated they would practice the yoga to relieve feelings "when I'm mad", "when I'm sad", "when I'm feeling stressed I could calm down", and "when I am very frustrated I will do the yoga". Two responses included references to mindfulness, "I could do things mindfully and notice things often and do the stretches" and another girl reported "think of what I'm doing".

Table 23. *Responses to the Evaluation Questions (n=63)*

Question	Yes n (%)	No n (%)	Maybe n (%)
Did you teach any kids at school? what you learned here?	12(19%)	51(81%)	N/A
Did anyone else practice the yoga at home with you?	39(62%)	24(38%)	N/A
Did you notice any changes in yourself?	43(68%)	20(32%)	N/A
Do you plan to continue practicing the yoga?	34(54%)	14(22%)	15(24%)

Summary

The purpose of this randomized cluster intervention study was to test the efficacy and feasibility of a mindfulness-based intervention based on mindful movement to decrease perceived stress, facilitate coping, enhance self-esteem and self-regulation in fourth and fifth grade girls measured by self-report questionnaires. The demographically comparable schools were randomized to the intervention school or wait-list control school. The efficacy was tested by Repeated Measures ANOVA with a Bonferroni correction at two time points immediately before and after the intervention. The data were analyzed with an intention to treat analysis followed by an evaluation of the effect of the dose (amount of home yoga practice and total attendance) of the intervention received by participants by multiple regression. The feasibility was explored by class attendance and qualitative evaluation data at week eight.

After the weekly program no significant differences were noted between the two groups in perceived stress, frequency or effectiveness of coping strategies, reported self-esteem, or self-regulation. However, there was a significant effect over time in reported

levels of self-esteem, and self-regulation in both groups. However, there were no significant between group differences. An interaction between group and time for perceived stress that approached significance with a small effect size was found. Compared to the control group, the intervention group was more likely to increase their perceived stress scores at Time 2. A significant interaction was also found between group and time in the frequency of coping with a small effect size. Compared to the control group, the intervention group was more likely to increase their frequency of coping score at Time 2.

Supplemental analyses with the "badness" subscale of the FBS (representing appraisal) was conducted. A significant interaction between group and time was found with a small to medium effect size. The intervention group was significantly more likely than the control group to increase their "badness" scores at Time 2.

To investigate the relationship between the "badness" and frequency of coping, Pearson Correlation Coefficients were calculated. The "badness" and frequency of coping scores were correlated at both Time 1 and Time 2 in the control group. The "badness" scores were not correlated with the frequency of coping scores in the intervention group at Time 1. However, in the intervention group at Time 2, the "badness" and frequency of coping scores were significantly correlated. Higher "badness" scores were related to higher coping frequency scores.

The dose of the intervention was defined as session attendance measured by weekly attendance and home yoga practice measured by self-report checklist. The amount of yoga practiced at home was significantly correlated with perceived stress and

predicted the perceived stress score. The more yoga home practice that was reported the greater the perceived stress score.

The feasibility of the intervention was evaluated by written evaluation questionnaire at week eight and session attendance. Most of the participants attended at least seven of the eight sessions, reported noticing changes in themselves, and planned to continue practicing yoga.

CHAPTER FIVE

Discussion

This study examined the efficacy of a mindfulness-based intervention to reduce stress in school-age girls through mindful movement. The underlying guide of the intervention was the Mindfulness-Based Stress Reduction program for adults (Kabat-Zinn, 1990/2005). The program was adapted to the development of school-age girls.

Two demographically comparable Massachusetts public schools were randomly assigned as the intervention school and wait-list control school. Fourth and fifth-grade girls were recruited from both schools. The intervention group met one hour a week for eight weeks and participants were expected to complete ten minutes of homework guided by audio CD six times a week reported by checklist.

Two research questions were addressed to assess the differences between the groups on self-report measures of perceived stress, coping, self-esteem, and self-regulation at two time points and the effect of the dose of the intervention on those outcomes. No significant differences between groups were found on the measured outcome variables (perceived stress, coping, self-esteem, and self-regulation). Significant changes over time in self-esteem and self-regulation were found in both groups.

The amount of home yoga practice was positively correlated with perceived stress. The amount of home yoga practice significantly predicted a higher level of reported perceived stress. Qualitative outcome data indicated that most participants noticed changes in themselves and plan to continue practicing yoga and mindfulness. The study fidelity,

findings, limitations, clinical implications, and recommendations for further research are discussed.

Intervention Fidelity

Delivery

The delivery of the intervention refers to the ability of the interventionist to provide the intervention as planned (Lichstein et al., 1994). The manualized intervention, which included a meditation and focus group at week eight, was not delivered due to a mandatory after school band practice. Therefore, seven of the eight planned sessions were delivered to participants. The eighth week would not have introduced new material, but would have reinforced the previously taught techniques. The loss of that instruction time most likely did not affect the delivery of the intervention. While not tested in children, Carmody and Baer (2009) found that the amount of time in an MBSR class was not correlated with psychological self-report study outcomes for adults. In their study, the effect sizes of 30 MBSR studies with a range of four to ten sessions of 1 to 2½ hours each were compared. No significant correlation between effect sizes and number of in-class hours was found.

The number of in-class hours and duration of mindfulness training with children has not been investigated. In studies of mindfulness with adolescents, the length of sessions and program duration varied from five to ten minute teacher-led meditations every day for five weeks (Beauchemin et al., 2008), 90 minute weekly classes for 12 weeks (Semple et al, 2009), and two hour weekly classes for 8 weeks (Biegel et al, 2009).

The concept of mindfulness was planned to be introduced according to the techniques of the MBSR program by mindful eating (Kabat-Zinn, 1990/2005). The raisin used with adults was to be substituted by a Hershey's Kiss® or choice of fruit. However, some parents reported that they did not allow their children to eat anything not brought from home. Therefore, mindful eating was changed to mindful drinking (water). The purpose of the mindful eating in the MBSR program is to demystify meditation and introduce the concept of experiencing things through the senses as if it is a completely new experience (Kabat-Zinn, 1990/2005). These purposes were accomplished through the adapted exercise. Children followed the same procedures as for mindful eating in the MBSR program.

Receipt

The receipt refers to the degree to which the participant actually received the treatment as intended (Lichstein et al., 1994**).** Due to the large required sample size and interest, each group included 20 to 27 girls. The adult MBSR program includes approximately 30 participants per group. While studies of mindfulness in children are scant, the extant literature of mindfulness in adolescents includes much smaller group sizes. Semple et al. (2009) enrolled 25 children for a randomized cross-lagged 12-week mindfulness-based cognitive therapy program. Each group consisted of eight children with one to two leaders. In a study of 7 to 8 year old children with anxiety, the group included five participants (Semple, Reid, & Miller, 2005).

According to yoga expert, M. Metzger, yoga classes with school-age children should include six to ten children, with greater than 10 children requiring a second adult

(M. Metzger, personal communication, January 22, 2009). The large group size may have affected the delivery of the intervention due to the need of the interventionist to interrupt the instruction to address behavioral issues.

To compensate for such a large group, research assistants attended each session for a ratio of four to six girls per research assistant. This, however, does not compensate for a crowded room and the occurrence of behavioral disruption. As the sitting meditations became longer or poses were held longer it was not uncommon for one girl to start laughing or talking that would disrupt the class. It was unclear if this was a result of increasing meditation and possible discomfort. Therefore, girls were not reprimanded. The interventionist would remind all girls to notice when they felt like talking or giggling and focus on breathing instead. The qualitative outcome data reflected this problem with some girls suggesting that in the future the girls who "fool around" should be separated.

The large class size also may have affected the receipt of the intervention by hindering the ability for individual attention and effective observation of all participants throughout the session. The weekly discussions may also have been limited by the class size. While not a focus group, discussion and expression of ideas within a group interaction is part of MBSR training. A focus group size of 8 to 10 participants is considered optimal to generate a range of views in discussion (Kennedy, Kools, & Krueger, 2001).

The developmental level and temperamental differences of children may necessitate smaller group sizes to create a safe and manageable environment that would

encourage more children to participate in the discussions. The large group sizes may have limited the input of participants that would have otherwise offered opinions and ideas.

The manualized intervention was also viewed at times as a hindrance to mindfulness training and maintaining the balance between repetition and interest. The individual differences between classes were subtle, but there were times when the interventionist perceived the need to introduce a varied posture, but was subdued by the need for intervention fidelity. It was unclear how the limited spontaneity affected interest or effects.

Children require educational programs to provide variety within a basic routine, flexibility of techniques to maintain interest, and the repetition of the training to facilitate learning (Thompson & Gauntlett-Gilbert, 2008). The lack of flexibility of the intervention was a hindrance to the teaching of mindfulness and conflicted with the MBSR philosophy of starting mindfulness training that meets the understanding and ability of the individual (Kabat-Zinn, 1990/2005).

Enactment

The enactment refers to the degree the participant demonstrates intended changes (Lichstein et al., 1994). The weekly group discussions at the beginning of class helped assess the issues and experiences of practicing the yoga at home and the understanding of mindfulness. The homework served as a self-report measure of home practice although it was not clear if the CD guide was always used.

The exploratory nature of this study made it difficult to monitor the development of mindfulness due to the lack of empiric data describing the process of developing

mindfulness in school-age children. As the program progressed, the participants reported difficulty with attention and described experiences during the week of mindfulness. Thompson and Gauntlett-Gilbert (2008) suggest that developing mindfulness may be manifested by children continuing to attend sessions and do homework while reporting negative feelings and experiences.

Study Outcomes

Perceived Stress

Perceived stress was measured by self-report questionnaire. The experience of stress is related to the appraisal of encounters experienced by individuals. All participants scored low on perceived stress at baseline, suggesting that both groups experienced low levels of stress in their daily lives. This sample included essentially well children and sought to investigate the developmental effects of mindfulness. This differs from studies of mindfulness with adolescents which included participants with specific problems such as reading problems (Semple et al., 2009), psychiatric diagnoses (Biegel, Brown, & Shapiro, 2009), learning disabilities (Beauchemin, Hutchins, & Patterson, 2008), or prehypertension (Barnes, Pendergrast, Harshfield, & Treiber, 2008).

The control group reported a slightly higher level of stress at baseline, but the difference was not significant. Post-intervention, the control group reported decreasing stress and the intervention group reported increasing stress, which may represent a regression to the mean. However, the trend of the increasing stress scores in the intervention group warrants further consideration.

The stress appraisal subscale of the Feel Bad Scale (stress) was examined. The intervention group was significantly more likely to report increasing stress appraisal scores (how "bad" they appraised particular stressors). The subscale of stress appraisal specifically asked participants how bad they would/did feel about a particular stressor. The appraisal was based on feelings. Mindfulness trains individuals to be aware of their feelings.

Mindfulness increases awareness of feelings and thoughts that enhance recognition of the stress reaction needed to generate coping responses (Salmon et al., 2004). The increasing stress appraisal scores in the intervention group may have reflected a greater awareness of the stress reaction and greater response of coping. This may be further supported by the significant correlation between coping frequency and stress appraisal scores post-intervention.

The most basic definition of mindfulness is a "moment to moment awareness" (Kabat-Zinn, 1990/2005 p.2). A characteristic of mindfulness is a nonjudgmental attitude towards thoughts and feelings (Kabat-Zinn, 1990/2005). Mindfulness includes intention, attention, and attitude. The development of mindfulness includes an attitude or quality of acceptance rather than judgment (Shapiro, Carlson, Astin, & Freedman, 2006). The inclusion of acceptance as a quality of awareness is also part of a proposed operational definition of mindfulness in adults (Bishop et al., 2004).

In a study with adults, yoga was the only home mindfulness technique that was significantly related to increasing of the non-judging facet of a mindfulness scale (Carmody & Baer, 2007). However, children may not have the ability after 8 weeks of

mindfulness training to cultivate nonjudgmental awareness. Rather, children may experience the basic description of mindfulness as awareness of the present moment without the qualities of acceptance and nonjudgment described in adults.

School-age children may not have the metacognitive ability to be aware of the present moment without the associated qualities of detachment, acceptance, observation, or non-judgment. The developmental tasks of school-age children include persistent judgments about the self in relation to the world, which may hinder the development of a non-judgmental attitude toward awareness.

The developmental tasks of this age include self-reflection through social comparison (Eccles, 1996), self-evaluation of competence (Harter, 1982), and mastery of culturally important skills (Erikson, 1950/1963). Self-evaluations become less positive during middle childhood. The development of self-esteem involves the perceptions of important others in a child's life. Developmental psychologist, Erikson (1950/1963) reported that while the family has the greatest influence on school-age children's self-concept, children leave the family for the outside world and the culture of school and peers. Teachers and peers have a strong effect on children (Erikson, 1950/1963). And during school-age years, children are beginning to change the way they view themselves (Eccles, 1999).

The persistent evaluations, comparisons, and competencies of school-age development suggest an inherent judgment of oneself in relation to others, thus hindering a nonjudgmental and accepting attitude towards mindful awareness.

The lack of these qualities of acceptance and nonjudgment may contribute to potential distress associated with the development of mindfulness. A greater duration of intervention, more emphasis on discussing the concept of nonjudgment or acceptance, or more individual attention may enhance the qualities of nonjudgment, acceptance, and compassion in children.

Due to the nature of childhood stressors, it is also possible that the increasing stress appraisal scores measured increasing stress in the study participants. Many of the stressors experienced by children are uncontrollable. Mindful awareness may, in fact, be a source of stress for children who are unable to change external circumstances. The process of becoming more aware of stress and stressors in life without the ability to change them may increase perceived stress for children. In a qualitative study by Jacobson (1994), children referred to the daily hassles of their life as expected, uncontrollable, and related to luck.

The increasing stress appraisals may also rise, transiently, as part of the process of developing mindfulness. Hayes and Feldman (2004) suggest that as mindfulness increases, one may become more aware of the factors that maintain the usual stress reaction and result in greater distress. Mindfulness is a process that includes a "destabilizing aspect" as usual patterns of behavior are recognized and possibly altered (Hayes & Feldman, 2004 p. 258). As awareness of feelings progresses, one may become aware of difficult emotions leading to increased perceived stress.

This exposure to thoughts and feelings through mindfulness may actually contribute to distress as automated reactions are lessened (Chödrön, 2001). Symptoms of

depression were noted to temporarily worsen after the second phase of mindfulness training with adults (9 to 18 weeks). This period was also studied with written journals that were analyzed and found to reflect the processing of emotions. The increased symptoms of depression during this period predicted lower levels of depression post intervention and were considered part of the process of mindfulness (Hayes & Feldman, 2004).

Adult participants in a qualitative study of the process of mindfulness-based cognitive therapy described an initial experience of negativity and challenge (Mason & Hargreaves, 2001). The period of negativity or difficulty was also found in a study of an eight-week MBSR program on stress and burn out in 25 nurses. Nurses reported noticing emotions described as difficult which increased as the mindfulness training progressed. The nurses described an increased awareness of emotions and memories that was difficult, but useful. The overall value rating of the program was 9.2 out of 10 and the nurses reported greater self care and improved relationships post-intervention(Cohen-Katz et al., 2005).

Studies of mindfulness in adults suggest that MBSR reduces stress, including self-reported perceived stress (Chiesa & Serretti, 2009). However, stress reduction is not a consistent finding. Robinson et al. (2003) reported a small non-significant decrease in cortisol and no significant differences in stress scores with individuals infected with HIV. The perceived stress was high in both the experimental and control groups. The authors suggested that the termination of the group may have had an effect on the posttest stress scores, reflecting the potential buffering effect of social support. While participants in the

present study expressed sadness that the group was ending and one girl wrote a song for the class, it is unlikely that the ending of the group affected the stress scores because of the generalized nature of the stressors on the Feel Bad Scale.

As the mindful awareness of feelings associated with stress, uncontrollable stressors, and difficult emotions develops in children, increasing stress may result. Mindfulness training with children requires mental health professionals and multidimensional interventions to assist children with the concrete management of identified stressors and situations.

Families need to be involved with mindfulness training, either as participants or at least educated in the principles and concept of mindfulness. The development of mindfulness in a child who is confronted with an external situation that does not support or understand mindfulness practice may increase stress.

Coping

The number of coping strategies was to be tested in this study, but the missing data precluded an accurate count of the number of strategies. However, the list of 26 strategies would not have accounted for all possible strategies used by school-age children. The number of coping strategies in a child's repertoire may not be as important an indication of greater coping ability as the frequency of their use (Ryan-Wenger, 1990). Younger children report using more coping strategies than older children, suggesting that younger children may be experimenting with multiple strategies, while children older than 10 years of age may use a fewer number of coping strategies that they may have found effective (Ryan-Wenger, 1990).

The frequency of use of coping strategies was not significantly different between groups. It was hypothesized that the mindfulness training would increase the recognition of the stress response and increase the frequency of coping and the effectiveness of those strategies. The participants in the intervention group were significantly more likely to report increasing frequency of coping at post-intervention. This may reflect a greater ability to generate coping strategies in response to greater recognition of stress, supported by the correlation between stress appraisal and coping frequency post-intervention.

The error in the effectiveness subscale may have underestimated the coping effectiveness. Multiple problems were noted with this subscale. Many participants reported always using a particular strategy, but then reported that they never did it on the effectiveness scale. This most likely reflected the error on the scale. However, many participants also reported never using a strategy, but then reported the effectiveness as "helps a lot". The two negative item-total correlations at both time points also limit the usefulness of this scale. The focus group that pre-tested scales consisted of seven girls who may not have been representative of the study sample.

A specific coping strategy can not be evaluated as an effective strategy without taking into account the child's individual temperament and the perceived and actual changeability of the stressor. Contextual factors need to be considered as well as short-term and long-term outcomes. Short-term benefits may be reported, but at the cost of not serving a longer-term benefit, such as learning a new coping strategy (Rothbaum et al., 1982). Specific types of strategies may be more effective in situations that are correctly appraised as controllable and other strategies are best for situations that are correctly

appraised as uncontrollable (Folkman, 1984). Children not only report multiple uncontrollable stressors, but also the need to generate coping strategies that match the controllability of the stressor (Band & Weisz, 1988; LaMontagne et al. 2004).

The concept of childhood coping has been viewed theoretically as a form of emotional regulation or regulation of the self under stress (Compas, 2001). In this study there was no significant correlation between the frequency or effectiveness of coping strategies and self-regulation in either group at either time point.

The participants reported the ability to calm themselves when feeling stressed and reported the intention to breathe and do yoga poses when they feel stressed or mad. Many girls reported the intention to practice the techniques when stressed rather than understanding the value of daily practice. The mindfulness training appeared to be a coping strategy, rather than a daily practice. The limited abstract thinking in school-age children may have hindered the ability to perceive the long term value of daily practice as a preventive strategy.

Self-esteem

No statistically significant difference was found between the groups in level of self-esteem. Both groups had high levels of self-esteem at baseline and both improved over time. The measure appeared to lack sensitivity for children with high levels of self esteem. The mean scores in this sample were higher than other samples (Granleese & Joseph, 1994; Harter, 1985). Beigel et al. (2009) found an increase in self-esteem for adolescents with diverse psychological diagnoses after a modified eight-week MBSR programs at three months post intervention.

The relatively high levels of self-esteem in this sample may have reflected the developmental levels of self-esteem (Robins & Trzesniewcki, 2005). One of the purposes of this study was to provide developmental assets prior to the expected stressors of adolescence when self-esteem in girls is reported to decrease. Harter (1985) notes a decrease in self-esteem in middle school, especially eighth graders. This sample is younger than the samples of Biegel et al. (2009) and Harter (1985).

One technique introduced to participants was loving-kindness meditation directed towards animals (Fontana & Slack, 1997). Many participants reported this difficult to do with animals they did not like. The homework for one week included daily brief loving-kindness mediation. The following week, girls reported feeling "proud" of themselves for being able wish health to an animal they did not like. The effects of the specific practice of loving-kindness meditation may be studied in populations at risk for lower self-esteem.

Self-regulation

The Healthy Self-regulation subscale was developed as part of a measure of mindfulness in adolescents and the subscale was found to be sensitive to mindfulness training with adolescents (A. West, personal communication, March 21, 2009). The Cronbach's Coefficient Alpha was adequate for this sample and was significantly correlated positively with self-esteem. Self –regulation scores were not significantly different between groups at baseline with both groups reporting moderate self-regulation. This may have been reflected by the infrequent report of hitting or picking on someone as coping responses in the coping frequency scale. There was a significant effect for time in both groups that may have reflected the progress as the new school year progressed or

maturation with age. The timing of the testing may have affected the increasing scores. Baseline testing was completed at the beginning of the new school year after the summer recess and before the school routines were established. Time 2 (post-intervention) was approximately three months into the school year when school and extra-curricular routines were more established.

Mindfulness training may help focus attention, increase effortful control, and increase awareness of feelings and stress and allow a space for calmness and reflection prior to action. This subscale was developed as part of an attempt to operationalize mindfulness in adolescents. The Healthy self regulation subscale was found sensitive to mindfulness training by West with adolescents (A. West, personal communication, April 3, 2009) who may have had lower self-regulation scores at baseline than this sample of well school-age girls. Mindfulness may manifest differently in this sample of well school- age girls.

The relationship between self-regulation and mindfulness remains unclear. Self regulation related to effortful control may be best studied in the laboratory with attention network tasks as described in Chapter Two, to further understand the effects of mindfulness training on regulation and attention (Tang & Posner, 2009)

Home Yoga Practice

The amount of home practice of yoga significantly predicted the change in perceived stress. The amount of home yoga practice was measured by the return of the self-report homework checklist, therefore may not be an accurate assessment of home

yoga practice. Some participants may have overestimated their home practice, while others may have forgotten their forms and did not account for home practice times.

The more yoga was practiced at home, the greater the stress scores. The yoga accounted for a very small variance in the stress scores. This could have been attributed to the extra time allotted to an already busy day. The participants who did the most yoga may have perceived the yoga as mandatory school homework, thus increasing stress. Homework was described by school-age children to be a stressor in their lives (Ryan-Wenger, Sharrer, Campbell, 2005). A better label for the homework would have been "home practice".

The amount of yoga practiced at home was correlated with perceived stress, while the number of sessions attended was not significantly correlated with any outcomes. This is similar to the findings of Jensen and Kenny (2004) studying the effects of yoga with boys diagnosed with attention-deficit/hyperactivity disorder (ADHD). The number of sessions attended was significantly correlated with only one outcome (hyperactive-impulsive behavior), but the home yoga practice was significantly correlated with response time variability, ADHD, and global emotional lability. This may reflect a type of child or situation that supports a home practice or a greater effect related to the amount of practice time.

Since mindfulness was not measured it is also possible that the participants who practiced the yoga the most achieved a greater level of mindfulness that manifested in awareness of stress. Carmody and Baer (2007) found that the amount of yoga practiced at home was significantly correlated with the self-reported level of mindfulness in adults.

Yoga was found to be more strongly related to mindfulness than the other formal mindfulness practices (body scan and sitting meditation) in a sample of self-referred well adults attending an eight-week MBSR program.

Limitations

Limitations of this study included issues of sampling, intervention delivery, measurement, and design. The large number of participants in the groups, the lack of measuring mindfulness, and no longitudinal follow-up in this essentially well population may have accounted for the lack of differences between groups. The homogenous sample of primarily white school-age girls precludes generalization of the results to other populations. The large number of participants in sessions may have affected the receipt of the intervention due to behavioral disturbances, lack of adequate space, and limited individual attention.

While it is possible that the intervention did not adequately deliver mindfulness training, the program included the principles of MBSR presented as concrete activities including: non-judgment; patience; seeing things like it is the first time; trust; non-striving; acceptance; and letting go (Kabat-Zinn, 1990/2005). The adaptations of this program were similar to other mindfulness-based adolescent programs. Adaptations included reduced times of session length, meditation, homework, and no retreat. Differences between this study and others with adolescents included the ratio of interventionist to participants. Other programs provided one to two therapists for eight children. Unlike these other studies, which included adolescents with specific health or learning issues, this study included well children. While a stress-coping framework was

applied, the participants in this study did not have problems that were able to be measured by diagnostic criteria used for clinical problems.

The MBSR program on which this intervention was modeled includes several formal mindfulness practices. The participants are taught sitting meditation, body scan, and Hatha yoga. Towards the end of the program, participants may choose which they prefer to practice. While researchers suggest that the components of MBSR need to be studied separately to evaluate their unique contribution, it is possible that a limit to this study was the use of primarily only one technique (Hatha yoga).

The opportunity to try multiple techniques of mindfulness training which may appeal to individuals was missing from this intervention. The participants in this study were only introduced to a shortened sitting meditation and the body scan. The recognition of individual differences inherent in both stress-appraisal theory and MBSR philosophy may be addressed by offering multiple techniques. Mindful movement was chosen based on the developmental level of school-age children, but did not address the differences of children who preferred sedentary training techniques such as sitting meditation and the body scan. Other studies with children are needed to test the different techniques for MBSR.

The qualitative evaluation data included suggestions such as making different CD's and trading in class. Others reported enjoying the sitting meditation and visualizations. A few participants reported enjoying the loving-kindness meditation. While many of the techniques of MBSR were introduced to the participants, the homework and primary focus was only the mindful movement.

Limitations of measurement included the lack of the ability to measure mindfulness and only measuring the outcomes by self-report questionnaire. Self-report questionnaires risk the possibility of limited accuracy of the recollection by children. Children as young as 5 years (Zonneveld, McGrath, Reid, & Sorbi, 1997) to 9 years of age (Olds, Ridley, Dollman, & Maher, 2010) have demonstrated the ability of accurate self-report and recall. However, this is not a consistent finding. Children and adolescents (9-16 years of age) were asked to recall headache pain compared to a diary. The complaints of pain were described more negatively on recall questionnaire (van den Brink, Bandell-Hoekstra, & Abu-Saad, 2000). Anxiety may also affect the accuracy of recalling negative events. For example, 85% of 5 to 12-year-old children were able to accurately recall the initially-reported level of pain from a dental procedure 6 to 8 weeks post procedure. However, children with trait anxiety were more likely to recall greater pain than was initially reported (Rocha, Marche, & von Baeyer, 2009). Therefore, children with anxiety may overestimate the negativity of past experience.

The inclusion of parent or teacher observation may have added important information from another perspective regarding child behavior or intervention effects. For example, a mother wrote on one of the homework sheets that when her daughter started to get upset she saw her go to her room and sit with her eyes shut breathing. However, the perception of stressors and appraisal differs between parent and child report (Bagdi, & Phister, 2006). Parental observation of child interactions, behavior, and mindfulness practice would enhance the child self-report.

Teacher observations regarding self-regulation, attention, and child interactions would also add important information regarding behavioral changes that were not measured by the self-report questionnaires. While peer evaluation or observation may add interesting data to the relational effects of mindfulness, it would add an element of judgment and peer comparison that is not consistent with mindfulness training.

The mechanisms of mindfulness remain inconclusive, but reappraisal, recognition, and disruption of the automatic stress reaction are suspected to affect the stress response. Therefore, it may be more important to measure how long the stress reaction lasts, rather than how often stress was experienced.

The length of sessions or duration of program that is needed for mindfulness training for school-age children is not known. The intervention group in this study reported changes in stress and coping after eight weeks, but did not report stress scores in the expected direction. The increasing stress appraisal scores may have reflected awareness, rather than stress or may have been a transient spike in stress as part of the process of mindfulness that would have decreased at a later time point as previously noted. Few studies of mindfulness with children or young adolescents exist with which to compare these findings. However, studies of mindfulness-based practices with adolescents included measurements at 12 weeks (Barnes et al., 2009; Biegel et al., 2009; Semple et al., 2009) and a three-month follow-up measure (Beigel et al., 2009). It is possible that the expected effects of reduced stress in children require a longer intervention than the eight weeks of the MBSR program.

The design of this study was limited by only two repeated measures. The measure of only two time points precluded the possibility of significant changes at follow-up that have been observed with adolescents. Biegel et al. (2009) found no significant differences between treatment as usual and MBSR (adapted for adolescents with diverse psychological diagnoses) on outcomes immediately after the intervention at week 8. Significant differences between groups in stress, anxiety, self- esteem and psychological symptoms were found three months after the intervention. It is possible that a significant difference between groups may have been noted at a third time point.

The purpose of this study was to provide school-age girls with assets before the inevitable adolescent stressors; however, measurement did not include a third time measurement or longitudinal data including entry into middle school and adolescence when maladaptive coping is reported to increase (Hampel & Peterman, 2006) and stressors related to the transition to middle school are experienced (Rudoph, Lambert, Clark, & Kurlakowsky, 2001).

Feasibility and Clinical Implications

The qualitative evaluations by participants suggested that the intervention was enjoyed, well-attended, and most girls noticed positive changes in themselves and planned to continue practicing yoga. The adherence with this study remained high. The participants were reminded of the importance of their involvement, thanked weekly for attending, met in the same location at the same time with the same interventionist and research assistants. The participants received small gifts for returning their homework sheets that were discretely placed in a designated area and helped themselves to a gift

from a decorated box. The participants were not asked by the interventionist if they did their homework, but just reminded to hand it in if they did. This nonjudgmental approach may have influenced the adherence to the session attendance by participants who otherwise may have been hesitant because they did not have the homework sheet.

Despite the lack of significant group differences in the quantitative outcomes, this was an intervention with enthusiastic interest, good attendance, qualitative improvements, and no reported physical adverse effects. However, the risk of increased stress and with mindfulness training in children warrants further study and caution.

Future programs aimed to develop mindfulness in children need to consider the potential negative effects and manifestations of developing awareness in children, especially in uncontrollable external situations. For children, the beginning of mindfulness development may be experienced as simple awareness without the protective ability of compassion and nonjudgment.

Mental health professionals need to be available throughout the training period and after the program ends, as mindfulness may continue to develop with further practice. The destabilizing effects of mindfulness experienced by adults may also occur in children, who may not have the same ability to understand the associated feelings.

Parents, teachers, and participants may be educated about the possible effects of developing mindfulness in their lives. The realistic and long-term benefits of a mindfulness practice may be difficult to convey to children with a concrete and immediate orientation, but the expectations need to be addressed to maintain adherence and safety. Differentiating yoga as relaxation versus mindful movement is an important

distinction. The participants in this study were reminded to just notice breathing, movement, and feelings and that they may not feel relaxed. Despite increasing stress appraisal scores, adherence in this study remained high, suggesting that the participants did not experience a clinically-significant impact of the stress scores or discomfort that would encourage withdrawal.

The coordination of this study through the school nurse was effective and possibly added to the interest and adherence. The school nurse notified staff, procured locations, and served as a representative at the school every day for participants. The nurses assisted with collecting the data by reminding students and notifying after school program directors about the study. The nurses demonstrated an interest in childhood stress, wellness, and alternative approaches to health and healing.

Nursing education needs to recognize the current interest and potential of integrative health care and respond with curriculum and opportunities for nurses to develop self-care and contemplative practices. Programs such as mindfulness training should be offered in nursing education programs to introduce nurses to mind-body therapies as well as building personal resources and serve as a basis from which nurses may enhance their view of health and healing.

This training is essential for nurses in the community to lead integrative approaches to health and create health promotion programs within community organizations, such as schools. An essential part of any holistic practice is self care (American Holistic Nurses Association, 2007). Learning a self-reflective, awareness-based practice, such as MBSR, as an essential part of nursing education would be an

invaluable asset for nurse-patient relationships, healing, professional and personal development, and integrative health care. While some nurses may not accept the underlying philosophy of mindfulness, the exposure to a method of healing is a responsibility of nursing and nursing education.

Future Research

To further the understanding of the developmental effects of mindfulness, more studies need to include well children and measure developmental assets such as optimism and perceived support. One of the aims of this study was to build personal resources and developmental assets to assist children in managing impending developmental or unforeseen stressors and issues. Therefore, future interventions may require a booster dose of the intervention or monthly meditation sessions. Follow-up measurement should be conducted after the transition to middle school, when stress is suspected to increase and self-esteem to decrease.

Further research of mindfulness in children should include parents and teachers. Children's lives are inextricably woven with their families and adults. The increasing awareness of stress and increasing stress appraisals may be related to the uncontrollable nature of childhood stress. Therefore, the involvement of powerful others in the child's life that can effect the nature of the stressors is necessary, as well as support by social workers and school administrators. Semple et al. (2009) did include parents in information sessions and instruction in mindfulness with an unclear effect.

While this was not a formal part of this study, many girls reported that they included their families in the mindful movement (yoga) practice. Many parents reportedly

practiced with the participants, demonstrating the acceptance and possibility of a family intervention.

Programs within schools need to include families and teachers. Brooks (2006) recommends developing social competence and relationships between students and adults and cultivating involvement in the school environment. Teachers and nurses may be trained in mindfulness and can decide the best way to fit mindfulness training and practice within the school day in coursework or after school activities. For example, Barnes et al. (2008) measured the effects of breathing meditation from MBSR on the systolic blood pressure and heart rate of African American adolescents at risk for hypertension. The ten-minute meditations were guided by school teachers during health classes for 12 weeks.

Future programs need to include a plan to manage disruptions within the sessions and a plan of action for participants who may have difficulty with increasing meditation times. This reflects the previously discussed problems with the class size, which made it more difficult to address individual needs or difficulties. Future research manuals teaching mindfulness need to embed plans and options for flexibility within the sessions, while maintaining fidelity. The fidelity checklists may include only the essentials of mindfulness training to allow for individual options within a predetermined plan.

Ethical issues need to be addressed when working with different populations. Ethical considerations arise when teaching mindfulness to children in particularly stressful situations that may enhance awareness to issues that can not be changed. Multidimensional interventions need to be developed including parents and mental health

professionals. It may become more stressful for children to enhance mindfulness while living in a situation that includes multiple uncontrollable stressors and a lack of the understanding of mindfulness. The manifestation of mindfulness in different ages, genders, and cultures needs to be explored. The yoga as mindful movement was acceptable to the school-age girls in this study. Studies with boys may consider tai chi or martial arts rather than yoga.

The advancement of understanding mindfulness in children requires qualitative study to create an operational definition of mindfulness to measure mindfulness training as well as studies to understand the developing brain. Evidence of neurobiological effects of mindfulness meditation has been noted in the absence of differences in self-report. It has been questioned whether mindfulness is a trait or a state and whether self-report questionnaires should be used to measure a concept such as mindfulness (Davidson, 2010).

Physiologic measures may also be considered in understanding the effects of mindfulness practice and mechanism of action. Barnes et al. (2008) found a decrease in systolic blood pressure in pre-hypertensive adolescents with 12 weeks of breathing meditation twice daily. However, the participants were prehypertensive at baseline. It is unclear whether this same effect would occur with well children.

Summary

To truly prevent adult diseases and enhance healthy lifestyles, interventions must begin in childhood. The interest in complementary, alternative, and integrative health care is increasing in children (Post-White, Fitzgerald, Hageness, & Sencer, 2009;Tindle,

Davis, Phillips, & Eisenberg, 2005; Tsao, Meldrum, Kim, Jacob, & Zeltzer, 2007). Recent reviews of meditation in children (Black, Milam, & Sussman, 2009) and yoga for children (Birdee et al., 2009) suggest an increasing interest in integrative health care for children and the recognition of the need for evidence-based guidelines. Both reviews report a promising role for the respective treatment, but lack sufficient data to draw conclusions.

No significant quantitative differences between the two groups were found in this study. An increase in self-esteem and self-regulation over time was noted in both groups most likely due to maturation. The inclusion of the control group was essential to detect this effect as a function of time rather than mindfulness training.

Mindfulness is theorized to increase awareness of the stress reaction as a basis from which to generate coping strategies. It was hypothesized that mindfulness practice would decrease perceived stress through reappraisal and flexibility of coping. However, the intervention group was more likely to report increasing stress appraisals and frequency of coping scores post-intervention. The increasing stress appraisals may reflect an increasing awareness of the feelings associated with the reaction to stress and the generation of coping, supported by the significant correlation between stress appraisals and frequency of coping post intervention. The greater the stress appraisals, the greater the frequency of coping reported.

The effects of the awareness experienced by the participants may be limited by cognitive and social development and reflect the basic definition of mindfulness as an awareness of the present moment without the attitude of nonjudgment and acceptance

associated with adults. This may reflect metacognitive development or the developmental tasks of school-age children that involve peer comparison and self-evaluation. The developmental judgment of the self, prevalent during this period, may hinder the ability to approach experiences nonjudgmentally.

The increasing stress appraisals may also measure a transient increase in stress as old patterns of behavior are recognized and replaced, but also may reflect the uncontrollable stressors experienced by children. The increasing stress appraisals raise ethical and developmental concerns. The prevalence of uncontrollable stressors experienced by school-age children necessitate the involvement of family and mental health professionals in future mindfulness interventions. Multidimensional interventions are needed to address the needs of children who may become aware of stressful aspects of their lives and need the tools to manage their situations.

This manualized intervention lacked the flexibility to meet the perceived needs of the individual classes. Future interventions may include provisions and options for flexibility, while maintaining research fidelity.

The adherence and interest in this study remained high through consistency, connectedness, gratitude, and clear expectations. The participants met at the same time, day, and location each week with the same interventionist, research assistants and session routine. The participants were reminded of the importance of their participation and thanked weekly. Small gifts were given in receipt of the homework forms. The assent and expectations were described at session one and the assent signed and kept by each participant.

Future research needs to include control groups and additional data measurement points to assess duration or delayed effects of mindfulness training. Group sizes need to be smaller than this study to affect the receipt of the intervention. The power analysis for this study and the limited number of days available at the school sites required larger class sizes than anticipated. A ratio of six to eight children to one interventionist would be useful in future studies to monitor the receipt and enactment of the intervention and address individual needs. Future studies need to pretest instruments and intervention ideas with a focus group representative of the intended sample. This sample of school-age girls was amenable to yoga as mindful movement. Other cultures or boys may prefer mindful movement as tai chi, or one of the other formal mindfulness practices.

Measurement needs to include multiple perspectives such as parents and teachers in addition to self-report to add further understanding of the behavioral effects of mindfulness training. Instruments or tests that measure recovery from the reaction to stress, rather than the amount of stress perceived or encountered may be a more accurate measure of the effects of mindfulness training.

Nurses have the obligation to develop the evidence and knowledge of potentially therapeutic interventions and evaluate possible adverse effects. The use of mind-body interventions to enhance healing and quality of life is a responsibility of Nursing (ANA, 2003). School nurses need research training to facilitate the conduction of school-based research for children to build evidence-based interventions needed in school health. Informing and educating teachers, office staff, extracurricular activity providers and other school personnel about the proposed study is needed to facilitate student participation.

Knowledge regarding parent-school dynamics, school protocols, and awareness of special activities within and after the school day that may interfere with study times is needed to ensure participant adherence. After school research interventions should conform to school protocol that is familiar to parents and students.

The role of participation varies by school nurse depending on interest, knowledge, time constraints, and role within the school. Clear expectations should be discussed while planning the research protocol.

This study adds to the nascent understanding of how mindfulness is taught to children, how it is manifested in children, likelihood of adverse events, and possible outcomes in children. Further study is needed to develop an operational definition of mindfulness in children and a theoretical model that reflects concepts within a resiliency and developmental framework in order to understand the unique experiences and mechanisms of mindfulness on the development of well children.

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APPENDIX A

Recruitment Letters, Consent, and Assent

Boston College
William F. Connell School of Nursing

Dear Parents/Guardians,

Greetings. My name is Laura White and I am a nursing doctoral student at Boston College. My advisor is Dr. Joyce Pulcini from the Connell School of Nursing at Boston College. I am writing to request your consent for your daughter to participate in a research study. Your daughter was chosen because she is in fourth or fifth grade and in the Miller School. The study seeks to understand if yoga and meditation reduces stress in girls. We want to develop ways to help girls effectively deal with stress.

This part of the study involves meeting after school two times for about 1 hour each time about 8 weeks apart. Your daughter will be asked to fill out some questionnaires about stress, coping, self esteem, and self-regulation both times. As a thank you for participation, your child will receive a $10 gift card and small gifts. The risks may be feeling sad thinking about stress.

Then, your daughter can take the yoga classes after school for about 45 minutes to 1 hour a week for 8 weeks. The girls will be taught techniques to reduce stress with yoga and meditation and discuss their experience with yoga. While we do not want to exclude anyone, if your daughter needs one to one assistance, this study is not good for her. We hope in the future to extend this study to all children. This study has been reviewed by the Miller School and the Human Subjects Review Board (IRB) of Boston College. The IRB is in charge of making sure that the rights and safety of each person are protected. She can stop participating at any time. All personal information will be kept confidential. We hope you and your daughter will agree to participate. We really want to understand how to help girls learn effective ways to deal with stress.

If you have any questions about this research project, please contact me, Laura White**.** You may call collect if you wish. If you have any questions about your rights as a research participant, you can call the Institutional Review Board at (617-552-4778). If you agree to have your child participate, please read and sign the attached consent and assent form with your daughter. Please ask your daughter to return the consent, assent, and family information form in the envelope to the special box in the nurse's office. You may keep the extra consent for your records. A copy of the assent will be given at the first meeting. The first meetings are scheduled for September 17, 2009 and November 19, 2009. Please return the forms by September 15, 2009.

Thank you very much for considering your daughter's participation in this study.

Sincerely,

Laura White, RN
508-881-3546
Boston College, Connell School of Nursing

Boston College
William F. Connell School of Nursing

Dear Parents/Guardians,

Greetings. My name is Laura White and I am a nursing doctoral student at Boston College. My advisor is Dr. Joyce Pulcini from the Connell School of Nursing at Boston College. I am writing to request your consent for your daughter to participate in a research study. Your daughter was chosen because she is in fourth or fifth grade and in the Mindess School. The study seeks to understand if yoga and meditation reduces stress in girls. We want to develop ways to help girls to effectively deal with stress.

The study would involve meeting after school for about 1 hour a week for 8 weeks. The girls will be taught techniques to reduce stress with yoga and meditation, discuss their experience with yoga, and fill out some questionnaires about stress, coping, self esteem, and self-regulation. The girls will be asked to practice yoga about 10 minutes a day with a CD, and record it on a paper. As a thank you for participation, your child will receive a yoga mat and small gifts. They will be asked weekly about how it was to do the yoga that week and if they noticed any changes in how they feel. The risks may be feeling sad talking about stress or physical injury if not following the directions. While we do not want to exclude anyone, if your daughter needs one to one assistance, this study is not good for her. We hope in the future to extend this study to all children.

This study has been reviewed by the school and the Human Subjects Review Board (IRB) of Boston College. The IRB is in charge of making sure that the rights and safety of each person are protected. Your child can choose not to talk or not to practice the yoga. She can stop participating at any time. All personal information will be kept confidential. The classes will be audio-taped and no child will be able to be identified. We hope you and your daughter will agree to participate. We really want to understand how to help girls this age learn effective ways to deal with stress.

If you have any questions about this research project, please contact me, Laura White**.** You may call collect if you wish. If you have any questions about your rights as a research participant, you can call the Institutional Review Board at (617-552-4778). If you agree to have your child participate, please read and sign the attached consent and assent form with your daughter. Please ask your daughter to return the consent, assent, and family information form in the envelope to the special box in the nurse's office. You may keep the extra consent for your records. A copy of the assent will be given at the first meeting. The classes will start the week of September 21, 2009. Please return the forms by September 15, 2009.

Thank you very much for considering your daughter's participation in this study.

Sincerely,

Laura White, RN
508-881-3546
Boston College, Connell School of Nursing

Boston College
Connell School of Nursing

Informed Consent for Participation as a Subject in Reducing Stress in School-age Girls: Mindful Awareness for Girls through Yoga (MAGY)

Introduction

Your daughter is being asked to be in a research study to find out if yoga and meditation decreases stress in girls. Your child was selected because she is in fourth or fifth grade and in public school. We ask that you read this form and ask any questions before agreeing to be in the study.

Purpose of Study:

The purpose of this study is to understand whether brief yoga and meditation affects stress, coping, self-esteem, and self-regulation.

Description of Study Procedures:

There are 2 groups that will learn yoga, but at different times. If you agree to be in this study, we would ask your daughter to do the following things: Participate in a group with other fourth and fifth grade girls for about 1 hour after school twice. She will fill out questionnaires about stress, coping, self-esteem, and self-regulation at one week and again about 8 weeks later. After that, she can take yoga and meditation classes after school. The classes will meet one day a week for 8 weeks. She will learn techniques to manage stress and talk about her experience about practicing yoga and about any changes in how she feels and reacts to stress.

Risks to Being in Study:

The study has the following risks. Thinking about stressful experiences may make your daughter feel sad.

Benefits of Being in Study:

There may be no direct benefits of participation is this study.

Payments:

Your daughter will receive a $10 gift card at the second meeting for participating, even if she does not complete the whole group.

Costs:

There is no cost to you to participate in this research.

Confidentiality:

The records of this study will be kept private. Research records will be kept in a locked file. Only the researchers will have access to the records. An exception is if a participant discusses risks to safety. In this case the information may be shared in order to help the child.

We will make every effort to keep your research records confidential, but it cannot be assured. Records that identify you and the consent form signed by you, may be looked at by a regulatory agency such as: Federal agencies overseeing human subject research, and the Boston College Institutional Review Board.

Voluntary Participation/Withdrawal:
Your daughter's participation is voluntary. If you or she choose not to participate, it will not affect your relationship with Boston College or Holliston Public Schools. You are free to withdraw at any time, for whatever reason. There is no penalty if you do not participate or stop.

Contacts and Questions
The researcher conducting this study is Laura White. For questions or more information concerning this research you may contact her at 1-508-944-9095.

If you have any questions about your rights as a research subject, you may contact: Director, Office for Human Research Participant Protection, Boston College at (617) 552-4778, or irb@bc.edu

Copy of Consent Form**:**
Please keep the copy of the consent form for your records**.** The girls will be given a copy of the assent at the group.

Contact Information:
We will contact you if your daughter unexpectedly misses a session
Parent phone number_____
Parent cell Phone number_____
Emergency contact _____
E-mail_____

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent for my daughter to participate in this study. I have received (or will receive) a copy of this form.

My daughter will participate _____ My daughter will NOT participate_____

Signature/Dates
Study Participant Name:_____
Legal Representative(guardian):_____Date_____

Boston College
Connell School of Nursing

Informed Consent for Participation as a Subject in Reducing Stress in School-age Girls: Mindful Awareness for Girls through Yoga (MAGY)

Introduction

Your daughter is being asked to be in a research study to find out if yoga and meditation decreases stress in girls. Your child was selected because she is in fourth or fifth grade and in public school. We ask that you read this form and ask any questions before agreeing to be in the study.

Purpose of Study:

The purpose of this study is to understand whether brief yoga and meditation affects stress, coping, control, and self esteem.

Description of Study Procedures:

If you agree to be in this study, we would ask your daughter to do the following things: Participate in a group with other fourth and fifth grade girls for about 1 hour after school for 8 weeks and fill out questionnaires. She will learn techniques for stress reduction and talk about her experiences about practicing yoga and about any changes she notices about how she feels and reacts to stress. The classes will be audio-taped. She will be given a CD to guide her in a 10 minute yoga practice to do every day and put a check mark on a homework sheet after the practice. The assent form will be read aloud by the researcher, and the girls encouraged to ask questions throughout the study.

Risks to Being in Study:

The study has the following risks: Talking about stressful experiences may make your daughter feel sad. She could have a physical injury if she does not follow directions for yoga.

Benefits of Being in Study:

There may be no direct benefits of participation is this study.

Payments:

Your daughter will receive a yoga mat, and other small gifts for participating, even if she does not complete the whole study.

Costs:

There is no cost to you to participate in this research.

Confidentiality:

The record and audiotapes of this study will be kept private. Research records will be kept in a locked file. Only the researchers will have access to the records. An exception is if a participant discusses risks to safety. In this case the information may be shared in order to help the child. We will make every effort to keep your research records confidential, but it cannot be assured. Records that identify you and the consent form signed by you, may be looked at by a regulatory agency such as: Federal Agencies overseeing human subject research, and the Boston College Institutional Review Board.

Voluntary Participation/Withdrawal:
Your daughter's participation is voluntary. If you or she chooses not to participate, it will not affect your relationship with Boston College or Ashland Public Schools.
You are free to withdraw at any time, for whatever reason.
There is no penalty if you do not participate or stop.

Contacts and Questions
The researcher conducting this study is Laura White. For questions or more information concerning this research you may contact her at 1-508-944-9095.

If you have any questions about your rights as a research subject, you may contact: Director, Office for Human Research Participant Protection, Boston College at (617) 552-4778, or irb@bc.edu

Copy of Consent Form:
Please keep the copy of the consent form for your records. The girls will be given a copy of the assent at the first meeting.

Contact Information:
We will contact you if your daughter unexpectedly misses a session
Parent phone number_____
Parent cell Phone number_____
Emergency contact _____
E-mail_____

Statement of Consent:
I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent for my daughter to participate in this study. I have received (or will receive) a copy of this form.

My daughter will participate _____ My daughter will NOT participate_____

Signature/Dates
Study Participant: _____
Legal Representative Signature: _____Date_____

Please put a 1 and 2 on your first and second choice of day

Monday_____ Tuesday _____ Thursday_____

Boston College
Connell School of Nursing
Informed Child Assent for Participation as a Subject in Reducing Stress in School-age Girls: Mindful Awareness for Girls through Yoga (MAGY)

This is a program to find out if doing yoga decreases stress. This project is being done by a nursing student at Boston College named Laura White. You can help with this project if you want. You do not have to if you do not want.

You will be part of a group of girls around your age. You will meet after school twice to fill out some forms about stress. The group will last about 1 hour. You will fill out questionnaires one week and then about 8 weeks later. After that you can learn fun yoga. You can stay after school one day a week for 8 weeks.

Your name will not be put on any papers. You can change your mind. You can stop at any time. If you want to help with this project, please write and sign your name on the lines.

Name_____

Signature_____

Boston College
Connell School of Nursing
Informed Child Assent for Participation as a Subject in Reducing Stress in School-age Girls: Mindful Awareness for Girls through Yoga (MAGY)

This is a program to find out if doing yoga decreases stress. This project is being done by a nursing student at Boston College named Laura White. You can help with this project if you want. You do not have to if you do not want.

You will be part of a group of girls around your age. You will meet after school one day a week for 8 weeks. You will learn fun yoga and talk about what you think about it. The group will last about 1 hour. You will fill out papers about stress on the first and last week. The meetings will be audio-taped. You will be asked to practice about 10 minutes of yoga everyday with a CD and check off that you did it.

You can change your mind. You can stop at any time.
If you want to help, please write and sign your name on the lines.

Name_____

Signature_____

APPENDIX B

_____ID Number FEEL BAD SCALE

1. Having parents separate	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
2. Being pressured to try something new, like a cigarette, that you really don't want to try.	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
3. Having your parents argue in front of you.	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
4. Not spending enough time with your mom and dad.	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
5. Feeling sick	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
6. Fighting with your parents about house rules.	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
7. Not having homework done on time.	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
8. Moving from one Place to another	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
9. Not getting along with your teacher	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
10. Being overweight or bigger than others your age	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
11. Changing schools	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
12. Not having enough money to spend	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
13. Not being able to	Not	A	Pretty	Real	Terrible	Never	1 or 2	Some-	Often	All the

dress the way you want to	Bad	Little Bad	Bad	Bad			Times	Times		Time
14. Feeling left out of the Group	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
15. Having nothing to do	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
16. Bing pressured to get good grades	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
17. Not being good Enough at sports	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
18. Being late for school	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
19. Feeling like your Body is changing	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time
20. Being smaller than others your age	Not Bad	A Little Bad	Pretty Bad	Real Bad	Terrible	Never	1 or 2 Times	Some-Times	Often	All the Time

What is the worst thing that has happened to you lately?

_____ID **SCHOOL-AGER'S COPING STRATEGIES INVENTORY**

Directions: this IS NOT A TEST! Do not put your name on this paper.

When some children feel stressed, nervous, or worried about something, they do some of the things listed below. Think about when YOU feel stressed, nervous or worried. Circle HOW OFTEN you do each of these things either <u>before</u> the stressful thing happens, <u>while</u> you feel stressed, or <u>after</u> the stressful thing is over. Then tell me HOW MUCH each thing helps you feel better when you feel stressed, nervous or worried.

_____

Stressful Thing

	HOW OFTEN DO YOU DO THIS?					HOW MUCH DOES IT HELP?			
1. Be by myself; be alone	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
2. Bite my nails or crack my knuckles	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
3. Cuddle my pet or stuffed animal	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
4. Cry or feel sad	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
5. Daydream	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
6. Do something about it	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
7. Do work around the house	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**

8. Draw, write, or read something	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
9. Eat or drink	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
10. Fight with someone	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
11. Get mad	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
	HOW OFTEN DO YOU DO THIS?					**HOW MUCH DOES IT HELP?**			
12. Hit, throw or break things	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
13. Pick on someone	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
14. Play a game or something	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
15. Pray	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
16. Run or walk away	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
17. Say I'm sorry or tell the truth	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
18. Sleep, take a nap	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
19. Talk to myself	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
20. Talk to someone	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**

21. Think about it	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
22. Try to forget about it	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
23. Try to relax, stay calm	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
24. Walk, run or ride my bike	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
25. Watch TV or listen to music	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
26. Yell or scream	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**

	HOW OFTEN DO YOU DO THIS?					**HOW MUCH DOES IT HELP?**			
27. Keep remembering what happened	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
28. Can't stop thinking about how I am feeling.	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
29. Thoughts about what happened just pop in my head.	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**
30. Can't stop thinking about why this happened to me.	**Never**	**Once in a while**	**A lot**	**Most of the time**		**Never do it**	**Does not help**	**Helps a little**	**Helps a lot**

Self-Perception Profile for Children

ID_____ What I Am Like

Really True for me	**Sort of True for me**				**Sort of True for me**	**Really True for me**
1. ____	____	Some kids are often *unhappy* with themselves	**BUT**	Other kids are pretty *pleased* with themselves	____	____
2. ____	____	Some kids *don't* like the way they are leading their life.	**BUT**	Other kids *do* like the way they are leading their life.	____	____
3. ____	____	Some kids are *happy* with themselves as a person	**BUT**	Other kids are often *not* happy with themselves.	____	____
4. ____	____	Some kids *like* the kind of person they are	**BUT**	Other kids often wish they were someone else	____	____
5. ____	____	Some kids are very *happy* being the way	**BUT**	Other kids wish they were *different.*	____	____
6. ____	____	Some kids *are* not very happy with the way they do a lot of things.	**BUT**	Other kids think the way they do things is *fine.*	____	____

_____ID Number Healthy Self-Regulation Scale

1. I accept myself even if I still have things to learn.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
2. If I realize I've forgotten what I'm doing in the middle of a task, I can bring my focus back.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
3. I need to get revenge if I'm insulted.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
4. Others could describe me as patient with myself.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
5. I have a peaceful attitude toward myself.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
6. My anger comes on too fast for me to stay in control.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
7. When I get annoyed I have a healthy way to calm down.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
8. I recognize when I'm getting upset and calm myself.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
9. I can stop myself from saying mean things.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
10. I am known to lose my temper.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
11. I am patient with other people.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always
12. I have a healthy and natural way to relax.	Almost never	Very rarely	Somewhat Rarely	Somewhat often	Very often	Almost always

Please answer these questions. There is no right or wrong answer.

What did you like about the yoga classes?

What didn't you like about the yoga classes?

What did you think about the homework?

What do you think should be different?

Did you teach any kids at school what you learned here?

Did anyone else practice the yoga at home with you?

Did you notice any changes in yourself?

Do you plan to continue practicing the yoga?

What are some ways that you can continue practicing the yoga and meditation?

Date _____

Family Information Form (All answers are strictly confidential)

Marital Status: Parents are:
Married_____ Divorced or separated_____ Single (never married) _____

Ethnicity: What is your child's ethnicity?
African American_____ Asian/Pacific Islander_____ Caribbean American_____
Latina_____ Native American_____ White_____ Other_____

Religion: Which best describes your family religion?
Catholic_____ Protestant _____ Hindu _____ Jewish_____ Muslim_____
Other_____

Mother: Highest level of education completed: No High School degree_____ High School graduate_____ College degree_____ graduate degree_____
Employment Status: Part time_____ Full time_____ Not working_____

Father: Highest level of education completed: No High school_____ High School graduate_____ College degree_____ Graduate degree_____
Employment Status: Part time_____ Full time_____ Not working now_____

Has there been a major family stress such as job loss, illness, moving, etc. in the past year? What? When?

_____

_____

Is there a medical diagnosis we should know about that may affect doing yoga?

Child Health Conditions	**Yes**	**No**
Diabetes with insulin		
Asthma		
Seizures		
Broken bones		
Glaucoma		
Back problems		
Surgery (operation)		
Other:		

Does your child have any allergies? Yes_____ No_____
If so, to what? _____
Does your child meditate or practice yoga at least one day a week?
Yes_____ No_____

APPENDIX C Intervention outline

LESSON PLAN

Week	Themes/discussion	Activity	Homework	Supplies
1	• Overview of program: attendance, homework, components (meditation, yoga) • Introduction to mind-body connection (focus: mind-body connection)	• Stress Measure (Feel Bad Scale). • Coping scale (Schoolagers' Coping Strategies Inventory). • Global Self Worth subscale of the Self-Perception Profile for Children (SPPC) • Healthy Self-Regulation Scale • Mind/body connection (stress symptoms)-Biodots®	• Find one place in home that can be a special place to relax. • Wear your Biodot® 24 hours and notice how thoughts and your body are connected.	Questionnaires Biodots Pencils Tape recorder Microphone Checklist Contact info Attendance list
2	• Centering • Review the week/discussion • **Introduction breathing** • **Introduction to yoga** • Discuss homework & practice log. (focus: beginner's mind, patience & body/breath awareness)	• Stress reactivity-STOP sign • Present moment awareness-Mindful eating/drinking • **Short breathing/sitting meditation** • Yoga 15 mins.	• Eat one thing mindfully every day • Give the CD and pictures of yoga routine. • Post the STOP sign somewhere. • Practice yoga everyday	Attendance Checklist Recorder Bell HW Mat STOP sign Kiss/raisin Water cups
3	• Collect homework • Centering/breathing • Review the week. (focus: letting go, trust & body/breath	• Worry box or tree (write down a worry and tear it or put it in a box or hung on a tree to then be thrown out. • Personalize yoga mat	• Do one thing mindfully each day (brush teeth, eat). • Yoga everyday	Attendance Checklist Recorder Bell HW

	awareness, intention/commitment	• Yoga 20 minutes.	• Practice log	Mat Collection box Gift Paper Pencils Bag to throw put “worries” Markers Water cups
4	• Collect homework • Centering • Review the week • **Introduce affirmation** (focus: nonjudgement, trust body & awareness of feelings)	• Breathing meditation 1 minute • Body scan • Body mapping (reinforce body scan) • Yoga 15 minutes	• Do something mindful every day (brush teeth, eat snack, brush hair, write) • Yoga everyday • Practice log	Attendance Checklist Recorder Bell HW Mat Gift Collection box Body pics Pencils Water cups
5	• Collect homework • Centering (focus: acceptance and patience with the progress of yoga & awareness of feelings)	• Breathing (3-5 minutes) • Review the week • **Introduce walking meditation** • Yoga 20 minutes • Body Scan	• Yoga everyday • Practice log	Attendance Checklist Recorder Bell HW Mat Gift Collection box Water

				Cups
6	• Collect homework • Centering • **Introduce Loving kindness** (focus: nonstriving & awareness of emotions)	• Seated breathing meditation 2-3 minutes • Review the week • Yoga 20 minutes • **Loving kindness meditation**	• Yoga everyday • Lovingkindness meditation once per day (written on homework sheet) • Practice log	Attendance Checklist Recorder Bell HW Mat Gift Collection box Cups water
7	• Collect homework • Centering • Review the week (focus: letting go & awareness of thoughts)	• Sitting meditation focus on thoughts-3-5 minutes • Give biodots • Yoga-15 minutes • Visualization • bubbles	• Yoga every day	Attendance Checklist Recorder Bell HW Mat Gift Collection box Water cups
8	• Collect homework • Pass around bell for children to ring it	• Post-test Scales • Evaluation form	• Yoga 3x/week • Do something mindfully daily • STOP	Attendance Bell Gift

YOGA POSTURES OVERVIEW

Week 2. (focus on awareness of breathing)	**Week 3.** (breathe & body)	**Week 4.** (feelings)	**Week 5.** (feelings)
Easy Sitting Mountain Side stretch (crescent moon) Table Cat/cow Child's pose/mouse Extended puppy pose Child's pose, mouse Sitting forward bend (rag doll) Corpse	Easy sitting Mountain Side stretch Tree Mountain Table Cat/cow Extended puppy pose Child's pose, mouse Cobra Child's pose, mouse Knee hug Supine spinal twist Corpse	Easy sitting Mountain Side stretch Tree Mountain Table Cat/cow Extended puppy pose Child's pose, mouse Cobra Child's pose, mouse Knee hug Baby Supine spinal twist Corpse	Easy sitting Mountain Tree-higher up on leg or arms above head or arms together) Mountain Star-may try goddess Triangle (left) Star Triangle (right) Star Mountain Table Cat/Cow Child's pose, mouse Corpse

Week 6. (emotions-aware of what feels good & what doesn't-notice thoughts as thoughts)	**Week 7.** (impermanence-postures don't last forever, mind-clinging, cessation, letting go)	**Week 8**.	
Easy Sitting Mountain Tree Mountain Standing Forward bend Spinal roll-up Mountain Star Triangle(right) Star Triangle (left) Star Mountain Table-try balance Cat/Cow Child's pose, mouse Puppy Stretch Mouse Knee hug Supine spinal twist Corpse	Easy sitting Mountain Side stretch Tree Mountain Table Cat/cow Extended puppy pose Child's pose, mouse Cobra Child's pose, mouse Knee hug or head to knee Baby Supine spinal twist Corpse	May create own sequence	

APPENDIX D

Institutional Review Board Notices of Approval

BOSTON COLLEGE
Institutional Review Board
Office for Research Protections
Waul House, 3rd Floor
Phone: (617) 552-4778, fax: (617) 552-0498

IRB Protocol Number: 09.235.01

DATE: June 9, 2009

TO: Laura White

CC: Joyce Pulcini

FROM: Institutional Review Board – Office for Research Protections

RE: Reducing Stress in School Age Girls: Mindful Awareness for Girls Through Yoga (MAGY)

Notice of IRB Review and Approval
Expedited Review as per Title 45 CFR Part 46.110, FR 60366, FR, # 7

The project identified above has been reviewed by the Boston College Institutional Review Board (IRB) for the Protection of Human Subjects in Research using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform the Office for Research Protections (ORP) of any injuries or adverse research events involving subjects;
4. You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;
5. You will only use the informed consent documents that have the IRB approval dates stamped on them (approved copies enclosed).

6. You will give each research subject a copy of the informed consent document;
7. You may enroll up to 140 participants.
8. **If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 60 days prior to the IRB approval expiration date. Without continuing approval the Protocol will automatically expire on June 8, 2010.**

Additional Conditions: Any *research personnel that have not completed an acceptable education/training program should be removed from the project until they have completed the training. When they have completed the training, you must submit a Protocol Revision and Amendment Form to add their names to the protocol, along with a copy of their education/ training certificate.*

Approval Period: **June 8, 2009- June 8, 2010**

Boston College and the Office for Research Protections appreciate your efforts to conduct research in compliance with Boston College Policy and the federal regulations that have been established to ensure the protection of human subjects in research. Thank you for your cooperation and patience with the IRB process.

Sincerely,

Stephen Erickson
Interim Director
Office for Research Protections

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BOSTON COLLEGE
Institutional Review Board
Office for Research Protections
Waul House, 3rd Floor
Phone: (617) 552-4778, fax: (617) 552-0498

IRB Protocol Number: 09.235.01A

DATE: September 4, 2009

TO: Laura White

CC: Joyce Pulcini

FROM: Office of Research Protections

RE: Reducing Stress in School Age Girls: Mindful Awareness for Girls Through Yoga (MAGY)

Notice of IRB Review and Approval-Amendment
Expedited Review as per Title 45 CFR Park 46.110, FR 60366, FR # 7

The amendment dated September 4, 2009 for the project identified above has been reviewed and approved by the Boston College Institutional Review Board (IRB) for the Protection of Human Subjects in Research using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

Amendment:

- Add return and start dates to recruitment letter.
- Change number and size of yoga groups.
- Add research staff: Leah White, Jessie Schiffman, Danielle Kaprielian, Phoebe Kurriss, Carly-Ann Palmieri, Amanda Foon and Sarah Cooper.

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform the Office for Research Protections (ORP) of any injuries or adverse research events involving subjects;

4. You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;
5. You will only use the informed consent documents that have the IRB approval dates stamped on them (approved copies enclosed);
6. You will give each research subject a copy of the informed consent document;
7. **If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 60 days prior to the IRB approval expiration date. Without continuing approval the Protocol will automatically expire on June 7, 2010.**

Additional Conditions: Any *research personnel that have not completed an acceptable education/training program should be removed from the project until they have completed the training. When they have completed the training, you must submit a Protocol Revision and Amendment Form to add their names to the protocol, along with a copy of their education/ training certificate.*

Approval Period: September 4, 2009 - June 7, 2010.

Boston College and the Office for Research Protections appreciate your efforts to conduct research in compliance with Boston College Policy and the federal regulations that have been established to ensure the protection of human subjects in research. Thank you for your cooperation and patience with the IRB process.

Sincerely,

Stephen Erickson
Interim Director
Office for Research Protections

TSL

BOSTON COLLEGE
Institutional Review Board
Office for Research Protections
Waul House, 3rd Floor
Phone: (617) 552-4778, fax: (617) 552-0498

IRB Protocol Number: 09.235.01B

DATE: March 9, 2010

TO: Laura White

CC: Joyce Pulcini

FROM: Office of Research Protections

RE: Reducing Stress in School Age Girls: Mindful Awareness for Girls Through Yoga (MAGY)

Notice of IRB Review and Approval-Amendment
Expedited Review as per Title 45 CFR 46.110, FR 60366, FR # 7

The amendment dated March 9, 2010 for the project identified above has been reviewed and approved by the Boston College Institutional Review Board (IRB) for the Protection of Human Subjects in Research using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

Amendment:
Increase number of participants from 140 to 190

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform the Office for Research Protections (ORP) of any injuries or adverse research events involving subjects;
4. You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;

The David Mindess School
90 Concord Street
Ashland, MA 01721

Mrs. Arlene J. Argir, Principal
Mr. Stephen A. Baroni, Assistant Principal

Telephone: (508) 881-0166
Fax: (508) 881-0153

April 8, 2009

Laura White, RN
Boston College William F. Connell School of Nursing
140 Commonwealth Avenue, Cushing 307
Chestnut Hill, MA 02467

Dear Mrs. White:

Stress is a health issue that affects a high percentage of students in the middle grades. The faculty and staff of the Mindess School in Ashland are working hard though the help of grant money to reduce student stress through physical activity.

As the principal of the Mindess School, I am happy to approve your request to do a pilot study with fourth and fifth grade girls on Mindfulness-Based Stress Reduction. As a school population, we recognize the impact stress has on students in terms of decreased time on learning because of absences as well as diminished capacity to cope with the everyday rigors of middle school.

Thank you for including the Mindess School in your study. The girls of Ashland will certainly benefit from your research.

Sincerely,

Arlene J. Argir

Arlene J. Argir
Principal

FRED W. MILLER ELEMENTARY SCHOOL
235 Woodland Street
Holliston, Massachusetts 01746

Phone: (508) 429-0667 **Fax: (508) 429-3684**

David N. Keim
Principal

Maureen Maloney
Assistant Principal

Karen McNamara
Student Services Administrator

April 15, 2009

Laura White, PhD(c),RN
19 Heritage Avenue
Ashland, MA 01721

Dear Ms. White,

Stress is a health issue that affects a number of our 4th and 5th grade girls in Holliston. As the Principal of the Miller Elementary School, I am happy to support your request to do an 8 week pilot study on a mindfulness based stress reduction program consisting mostly of yoga. The girls will meet after school; one day a week for eight weeks, for 45 minutes each class.

The Miller School recognizes the impact that stress has on the educational process for students in terms of decreased time on learning due to absences or early dismissals from school as well as diminished ability to concentrate on studies. We applaud your efforts to explore school nursing interventions that will improve the management of stress in our schools.

Respectfully,

David N. Keim

DNK/drh

APPENDIX E

Permission for Measures

From: Judith Siegel <jmsiegel@ucla.edu> view source
Subject: Re: Permission for FBS
Date: Mon, 23 Feb 2009 12:57:05 -0800
To: Laura White <whitlau@bc.edu>

Hello Laura,

Please feel free to use the scale. There are no costs associated with use. I'd enjoy hearing the results of your study. Good luck with that.

At 09:07 AM 2/23/2009, you wrote:

On Fri, 4 Apr 2008 20:58:49 -0400
| "Ryan-Wenger, Nancy" <nryanwen@con.ohio-state.edu> wrote:
| Laura:
| You may certainly use the Stressor and Coping Scales in your research!
|
| Nancy
|
|
| Nancy A. Ryan-Wenger, PhD, RN, CPNP, FAAN
| Professor, College of Nursing
| The Ohio State University
| Director of Nursing Research
| Nationwide Children's Hospital
| 700 Children's Drive
| Columbus, OH 4320

From: Susan Harter [mailto:sharter@du.edu]
Sent: Friday, October 31, 2008 4:03 PM
To: 'LAURA WHITE'
Subject: RE: SPPC permission for use

Laura,

Thank you for your interest in our work. Please see the attachments. (The flyer describes my 1999 book that provides all of the theoretical and research background, if you are interested.)